



## **2.6. Student Performance and Learning Outcomes**

**2.6.1 The institution has stated learning outcomes (Program and Course outcomes), graduate attributes, which are integrated into the assessment process and widely published through the website and other documents, and the attainment of the same is evaluated by institution.**





**Sample of course file. Student  
notebook. Practical notebook**



## Course Activity Sheet (Planning and Review)

Academic Year: 2024-25

Programme: B. Tech

Semester: I

Course Name: -

Mathematics - I

Course Code:- 23BTC-OMA11T

LTP: 3-1-0

School: School of Engineering & Technology

Faculty: Dr. Manimala

Planning Checklist

| S.No | Activity                                                                                                                                              | Status                                                                       |
|------|-------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------|
| 1    | Is the syllabus copy maintained and submitted by the faculty member?                                                                                  | Yes/No                                                                       |
| 2    | Is lecture plan signed and updated by the faculty member?                                                                                             | yes                                                                          |
| 3    | Is previous year question paper made available?                                                                                                       | yes.                                                                         |
| 4    | Is Time Table made available?                                                                                                                         | yes                                                                          |
| 5    | Number of Assignments planned                                                                                                                         | yes 2                                                                        |
| 6    | Number of quiz planned                                                                                                                                | 2                                                                            |
| 7    | Digital Learning LX (LMS – Review)<br>Is it updated with following (suggestive) :<br>Syllabus<br>Reference material<br>Video links<br>Quiz/Assignment | yes                                                                          |
| 8    | Is mapping of students available on ERP along with the timetable?                                                                                     | yes                                                                          |
| 9    | Suggest atleast one innovative way for better engagement of students in this course                                                                   | More practice<br>Set. Day by<br>day assign-<br>ment. Weekly<br>doubt session |

*Manimala*  
(Signature of Faculty Member with Date)

(Signature of Dean with Date)



## Mid-Semester Review

| S.No | Activity                                                                                                                                                                                      | Status                                                                                            |
|------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|
| 1.   | Is the attendance updated on ERP?                                                                                                                                                             | Yes/No                                                                                            |
| 2.   | Percentage of students who are not meeting the attendance criteria of 75%                                                                                                                     | 100%                                                                                              |
| 3.   | Pass percentage in Internal Assessment so far                                                                                                                                                 | 95%                                                                                               |
| 4.   | Identification and motivation for toppers<br>Student Roll No      Name<br>1 240BTCCSE018      Harshit Kr. Pandey<br>2 240BTCCSE046      Kyathika Rao Seelam<br>3<br>4                         | Mention the activities<br>Difficult level questions given                                         |
| 5.   | Identification and motivation for weaker students<br>Student RollNo      Name<br>1 240BTCCSE011      Yuvansh<br>2 240BTCCSE038      Bhanik Chauhan<br>3 240BTCCSE051      Mayank Rathore<br>4 | Mention the activities<br>More practice questions.<br>One-to-one interaction<br>Peer. guid (help) |

Dean's Review and recommendations

.....

.....

.....

.....

*Manimela*  
(Signature of Faculty Member with Date)

*[Signature]*  
(Signature of Dean with Date)



## End-Semester Review

| S.No | Activity                                                                  | Status                                                  |
|------|---------------------------------------------------------------------------|---------------------------------------------------------|
| 1.   | Is the attendance updated on ERP?                                         | Yes/No                                                  |
| 2.   | Percentage of students who are not meeting the attendance criteria of 75% | 0-1                                                     |
| 3.   | Pass percentage                                                           |                                                         |
| 4.   | Summary of CO attainment<br><br>CO1 - 2.25<br>CO2 - 1.65<br>CO3 - 1.85    | Sheet Attached<br>CO1 - 2.4<br>CO2 - 1.92<br>CO3 - 1.68 |
| 5.   | Student Feedback                                                          |                                                         |
| 6.   | Exit Feedback by faculty member for improvement in future                 | Will do more practice set & 1-1 to interaction          |

## Dean's Review

.....

.....

.....

*Manimela*  
(Signature of Faculty Member with Date)

(Signature of Dean with Date)



Timetable w.e.t. 06/November/2024

# Teacher Dr. Manimala

Ansal University, Sector 55, Golf Course Road, Gurgaon, Haryana - 122003

|    | 9:10 - 10:00<br>1                | 10:05 - 10:55<br>2               | 11:00 - 11:50<br>3               | 11:55 - 12:45<br>4            | 12:45 - 13:25<br>5 | 13:25 - 14:15<br>6               | 14:20 - 15:10<br>7               | 15:15 - 16:05<br>8 | 16:10 - 17:00<br>9 |
|----|----------------------------------|----------------------------------|----------------------------------|-------------------------------|--------------------|----------------------------------|----------------------------------|--------------------|--------------------|
| Mo | Mathematics-I                    | Discrete Mathematics             |                                  | Discrete Mathematics          |                    | Mathematics-I                    |                                  |                    |                    |
|    | B.Tech CSE - Section B (1st Sem) | B.Tech CSE - AI/ML (IInd Sem)    |                                  | B.Tech CSE - Cyber (IInd Sem) |                    | B.Tech CSE - Section A (1st Sem) |                                  |                    |                    |
| Tu | D-322                            | D-413A                           |                                  | D-305                         |                    | D-413A                           |                                  |                    |                    |
|    | Mathematics-I                    | Mathematics-I                    |                                  | Discrete Mathematics          |                    | Discrete Mathematics             | Remedial Class                   |                    |                    |
| We | B.Tech CSE - Section B (1st Sem) | B.Tech CSE - Section A (1st Sem) |                                  | B.Tech CSE - AI/ML (IInd Sem) |                    | B.Tech CSE - Cyber (IInd Sem)    | B.Tech CSE - Section A (1st Sem) |                    |                    |
|    | D-305                            | D-301                            |                                  | D-413A                        |                    | D-311                            | D-301                            |                    |                    |
| Th | Mathematics-I                    | Discrete Mathematics             |                                  | Discrete Mathematics          |                    | Mathematics-I                    | Remedial Class                   |                    |                    |
|    | B.Tech CSE - Section B (1st Sem) | B.Tech CSE - AI/ML (IInd Sem)    |                                  | B.Tech CSE - Cyber (IInd Sem) |                    | B.Tech CSE - Section A (1st Sem) | B.Tech CSE - Section B (1st Sem) |                    |                    |
| Fr | D-322                            | D-413A                           |                                  | D-301                         |                    | D-301                            | D-312C                           |                    |                    |
|    | Discrete Mathematics             | Mathematics-I                    |                                  | Discrete Mathematics          |                    | Mathematics-I                    |                                  |                    |                    |
|    | B.Tech CSE - AI/ML (IInd Sem)    | B.Tech CSE - Section B (1st Sem) |                                  | B.Tech CSE - Cyber (IInd Sem) |                    | B.Tech CSE - Section A (1st Sem) |                                  |                    |                    |
|    | D-413A                           | D-322                            |                                  | D-311                         |                    | D-301                            |                                  |                    |                    |
|    |                                  |                                  | Mathematics-I                    |                               |                    | Mathematics-I                    |                                  |                    |                    |
|    |                                  |                                  | B.Tech CSE - Section A (1st Sem) |                               |                    | B.Tech CSE - Section B (1st Sem) |                                  |                    |                    |
|    |                                  |                                  | D-301                            |                               |                    | D-322                            |                                  |                    |                    |
|    |                                  |                                  |                                  |                               |                    |                                  |                                  |                    |                    |

Timetable generated: 11/5/2024

5.5.2024

|                                                                                                                                                    |                               |                                                                                                                                                   |                                          |
|----------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|
| <b>Sushant University</b><br>Erstwhile Ansal University Gurugram                                                                                   |                               |                                                                                                                                                   | School of<br>Engineering<br>& Technology |
| <b>Course Outline</b>                                                                                                                              |                               |                                                                                                                                                   |                                          |
| <b>Course Title: Mathematics I</b>                                                                                                                 |                               |                                                                                                                                                   |                                          |
| <b>Semester: I</b>                                                                                                                                 | <b>Academic Year: 2024-25</b> | <b>Core/Elective: Core</b>                                                                                                                        | <b>Credits: 4, LTP: 3:1-0</b>            |
| <b>Course Designed by: Dr. Manimala</b><br><b>E-mail: <a href="mailto:manimala@sushantuniversity.edu.in">manimala@sushantuniversity.edu.in</a></b> |                               | <b>Course Instructor: Dr. Manimala</b><br><b>E-mail: <a href="mailto:manimala@sushantuniversity.edu.in">manimala@sushantuniversity.edu.in</a></b> |                                          |
| <b>Pre-requisites:</b> Basic concept of Matrix, Calculus, Sequence & Series and Trigonometry                                                       |                               |                                                                                                                                                   |                                          |

### 1. Course Outcomes:

Upon successful completion of the course, the students should be able to:

- CO1: Describe matrix algebra to solving engineering problems. Determine the eigenvalues and eigenvectors of a matrix
- CO2: Distinguish between the concepts of sequence and series. Determine convergence and divergence of series. Understand De Moivre's theorem and find the roots of complex numbers. Application of complex numbers for solving engineering problems
- CO3: Understand application of Leibniz's theorem & Taylor's theorem in real life problems. Demonstrate Knowledge of maxima and minima of function of two variables, Understand Homogeneous Function, asymptotes and curve tracing

### 2. Program Outcomes:

This section deals with how well this course meets the following eight overall program outcomes (POs):

- PO1: Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and engineering. Specialization to the solution of complex engineering problems.
- PO2. Problem analysis:** Identify, formulate, research literature, and analyze engineering problems to arrive at substantiated conclusions using first principles of mathematics, natural, and engineering sciences.
- PO3. Design/development of solutions:** Design solutions for complex engineering problems and design system components, processes to meet the specifications with consideration for the public health and safety, and the cultural, societal, and environmental considerations.
- PO4. Conduct investigations of complex problems:** Use research-based knowledge including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.



*Manimala*

**PO5. Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and modeling to complex engineering activities with an understanding of the limitations.

**PO6. The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

**PO7. Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

**PO8. Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

**PO9. Individual and team work:** Function effectively as an individual, and as a member or leader in teams, and in multidisciplinary settings.

**PO10. Communication:** Communicate effectively with the engineering community and with society at large. Be able to comprehend and write effective reports documentation. Make effective presentations, and give and receive clear instructions.

**PO11. Project management and finance:** Demonstrate knowledge and understanding of engineering and management principles and apply these to one's own work, as a member and leader in a team. Manage projects in multidisciplinary environments.

**PO12. Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

**PSO1:** Apply standard Software Engineering practices and strategies in real-time software project development using open-source programming environment or commercial environment to deliver quality product for the organization success

**PSO2:** Design and develop computer programs/computer-based systems in the areas related to algorithms, networking, web design, cloud computing, IoT and data analytics of varying complexity

**PSO3:** Acquaint with the contemporary trends in industrial/research settings and thereby innovate novel solutions to existing problems

### 3. CO and PO mapping

|     | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| CO1 | H   | H   | M   | L   | L   | M   | L   | L   | M   | L    | L    | M    | M    | L    | H    |
| CO2 | H   | M   | M   | M   |     | M   | L   | L   | L   | L    | L    | M    | M    | L    | M    |
| CO3 | H   | M   | M   | M   | L   | L   | L   | L   | M   | L    | L    | M    | L    | M    | H    |



*Maminala*

### Syllabus:

**Total Hrs.:** 56

## UNIT I- Matrices

**Total:** <sup>12</sup> hours

Matrices and its types, Rank of a matrix. Elementary transformations, Echelon-form of a matrix, normal form of a matrix, Inverse of a matrix by elementary transformations (Gauss-Jordan method).

Linear dependence and linear independence of vectors. Solution of system of linear equations. Non-homogeneous linear equations and homogeneous linear equations. Characteristic equation – Eigen values. Eigen

Characteristic equation – Eigen values – Eigen vectors – properties of Eigen values. Cayley-Hamilton theorem (without proof). Inverse of a matrix by using Cayley-Hamilton theorem. Modal matrix.

## UNIT II – Infinite Series

**Total: 10 hours**

**Definition of Sequence and series. Convergence of series – comparison test – D'Alemberts Ratio test. Cauchy's Root Test – Integral Test – Raabe's Test – Logarithmic Test – Gauss Test. Alternating series – Absolute convergence – Leibnitz's Rule (without Proof).**

### UNIT III - Complex Number

**Total: 12 hours**

De Moivre's theorem and roots of complex numbers. Expansion of  $\sin n\theta$ ,  $\cos n\theta$  and  $\tan n\theta$  in powers of  $\sin\theta$ ,  $\cos\theta$ ,  $\tan\theta$ . Complex exponential function, Complex trigonometry functions. hyperbolic functions, Inverse hyperbolic functions, Logarithm of complex numbers. Summation of trigonometric series.

## UNIT IV- Differential Calculus-I

**Total: 10 hours**

Successive differentiation, Leibnitz theorem and applications. Taylor's and Maclaurin's series (without Proof). Functions of two or more variables, limit and continuity, partial derivatives. Total differential and differentiability, derivatives of composite and implicit functions.

## UNIT V- Differential Calculus-II

**Total: 12 hours**

Higher order partial derivatives. Homogeneous functions and applications, Euler's Theorem, Jacobians, Maxima-minima of function of two variables. Lagrange's method of undetermined multipliers. Differentiation under integral sign (Leibnitz rule). Curvature, asymptotes, curve

Manu 19

#### 4. Text Book(s):

- T1.** N.P.Bali and Manish Goyal, "A Text book o Engineering Mathematics",Laxmi Publications (P) Limited, 2010.
- T2.** Dr. B. S. Grewal, "A text book of Higher Engineering Mathematics". 40 ed. Khanna Publishers, 2009
- T3.** B.V.Ramana, "A text book of Mathematics",Tata MC Graw Hill, 2009.

#### 5. Reference Book(s):

- R1:** Kreyszig Erwin, "Advanced Engineering Mathematics", 9th Edition, John Wiley & Sons, 2006.
- R2:** Peter.V.O.Neil, Advanced Engineering Mathematics. Canada: Thomson, 2007.
- R3:** R.K.Jain and S.R.K.Iyengar, Advanced Engineering Mathematics. 3 ed, Narosa Publishers, 2009
- R4:** H. K Dass, "Advanced engineering mathematics", 8th Edition, S. Chand, 2008
- R5:** Jain Iyengar, "Advanced Engineering Mathematics", 3rd Edition, Narosa Publishers, 2007

#### 6. Evaluation Scheme

| Exam Type                                        | Marks Breakup |
|--------------------------------------------------|---------------|
| Mid Semester Examination                         | 15            |
| End Semester Examination                         | 60            |
| Quiz                                             | 15            |
| Assignment/FacultyAssessment/Class Participation | 10            |
| Total                                            | 100           |

*Manish*



|                                                                                                                                                                           |                                                                                              |                                        |                                      |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------|----------------------------------------|--------------------------------------|
| <br><b>Sushant</b><br>University<br><small>Enriching Actual University Education</small> | <b>School of Engineering &amp; Technology</b><br><b>LESSON PLAN</b><br><b>COURSE OUTLINE</b> |                                        |                                      |
| <b>Course Title: Mathematics I</b><br><b>Course Code:- 23BTC-0MA11T</b>                                                                                                   |                                                                                              |                                        |                                      |
| <b>Term: I</b>                                                                                                                                                            | <b>Academic Year: 2024-25</b>                                                                | <b>Core/Elective:</b><br><b>Core .</b> | <b>Credits:</b><br><b>LTP: 3-1-0</b> |
| <b>Course Designed by:- Dr. Manimala</b>                                                                                                                                  |                                                                                              | <b>Course Instructor: Dr. Manimala</b> |                                      |
| <b>Pre-requisites:</b> Basic concept of set theory, permutation & combinations                                                                                            |                                                                                              |                                        |                                      |

### 1. Course Outcomes:

Upon successful completion of the course, the students should be able to

- CO1: Describe matrix algebra to solving engineering problems. Determine the eigenvalues and eigenvectors of a matrix
- CO2: Distinguish between the concepts of sequence and series. Determine convergence and divergence of series. Understand De Moivre's theorem and find the roots of complex numbers. Application of complex numbers for solving engineering problems
- CO3: Understand application of Leibniz's theorem & Taylor's theorem in real life problems. Demonstrate Knowledge of maxima and minima of function of two variables, Understand Homogeneous Function. asymptotes and curve tracing.

### Text Books:

- T1. N.P.Bali and Manish Goyal, "A Text book o Engineering Mathematics", Laxmi Publications (P) Limited, 2010.
- T2. Dr. B. S. Grewal, "A text book of Higher Engineering Mathematics".  
40 ed. Khanna Publishers, 2009
- T3. B.V.Ramana, "A text book of Mathematics", Tata MC Graw Hill, 2009.



*Manu*

## Reference Books:

R1: Kreyszig Erwin, "Advanced Engineering Mathematics", 9th Edition, John Wiley & Sons, 2006.

R2: Peter.V.O.Neil, Advanced Engineering Mathematics. Canada: Thomson, 2007.

R3: R.K.Jain and S.R.K.Iyengar, Advanced Engineering Mathematics. 3 ed, Narosa Publishers, 2009

R4: H. K Dass, "Advanced engineering mathematics", 8th Edition, S. Chand, 2008

R5: Jain Iyengar, "Advanced Engineering Mathematics", 3rd Edition, Narosa Publishers, 2007.

## 1. Lecture Plan ( Total hours -42)

| Lect<br>ures<br>num<br>ber | Topics to be covered                                                                     | UNIT<br>No. | Planned on | Taken<br>on | Methodolog<br>y used (PPT,<br>White<br>Board,<br>Audio/Video<br>, Practical,<br>Visit, Self<br>Study based) | Deans/pd<br>Remark<br>s with<br>Date |
|----------------------------|------------------------------------------------------------------------------------------|-------------|------------|-------------|-------------------------------------------------------------------------------------------------------------|--------------------------------------|
| 1                          | Matrices and its types,<br>Rank of a matrix                                              | Unit 1      | 12/08/24   | 12/10/24    | White<br>board                                                                                              |                                      |
| 2                          | Elementary<br>transformations,<br>Echelon-form of a matrix                               | Unit 1      | 13/08/24   | 13/10/24    | White<br>board                                                                                              |                                      |
| 3                          | normal form of a matrix,                                                                 | Unit 1      | 14/08/24   | 14/10/24    | White<br>board                                                                                              |                                      |
| 4                          | Inverse of a<br>matrix by<br>elementary<br>transformations<br>(Gauss- Jordan<br>method). | Unit 1      | 16/08/24   | 16/10/24    | White<br>board                                                                                              |                                      |
| 5                          | Linear dependence and<br>linear independence of<br>vectors                               | Unit 1      | 20/08/24   | 20/10/24    | White<br>board                                                                                              |                                      |



*Manimala*

|    |                                                                             |        |          |          |             |  |
|----|-----------------------------------------------------------------------------|--------|----------|----------|-------------|--|
| 6  | Solution of system of linear equations.<br>Non-homogeneous linear equations | Unit 1 | 21/8/24  | 21/8/24  | White board |  |
| 7  | homogeneous linear equations                                                | Unit 1 | 22/8/24  | 22/8/24  | White board |  |
| 8  | Characteristic equation – Eigen values – Eigen vectors                      | Unit 1 | 23/8/24  | 23/8/24  | White board |  |
| 9  | Properties of Eigen values                                                  | Unit 1 | 27/8/24  | 27/8/24  | White board |  |
| 10 | Cayley- Hamilton theorem (without proof)                                    | Unit 1 | 28/8/24  | 28/8/24  | White board |  |
| 11 | Inverse of a matrix by using Cayley-Hamilton theorem.                       | Unit 1 | 29/8/24  | 29/8/24  | White board |  |
| 12 | Modal matrix.                                                               | Unit 1 | 30/8/24  | 30/8/24  | White board |  |
| 13 | Definition of Sequence and series                                           | Unit 2 | 02/09/24 | 02/9/24  | White board |  |
| 14 | Convergence of series                                                       | Unit 2 | 3/9/24   | 03/09/24 | White board |  |
| 15 | Comparison test                                                             | Unit 2 | 04/9/24  | 04/9/24  | White board |  |
| 16 | D'Alemberts Ratio test                                                      | Unit 2 | 05/09/24 | 05/09/24 | White board |  |
| 17 | Cauchy's Root Test                                                          | Unit 2 | 09/09/24 | 09/09/24 | White board |  |
| 18 | Integral Test                                                               | Unit 2 | 10/9/24  | 10/9/24  | White board |  |
| 19 | Raabe's Test                                                                | Unit 2 | 11/9/24  | 11/9/24  | White board |  |



*Manish*

|    |                                                                        |        |         |          |             |  |
|----|------------------------------------------------------------------------|--------|---------|----------|-------------|--|
| 20 | Logarithmic Test                                                       | Unit 2 | 12/9/24 | 12/9/24  | White board |  |
| 21 | Gauss Test.                                                            | Unit 2 | 13/9/24 | 13/9/24  | White board |  |
| 22 | Alternating series                                                     | Unit 2 | 17/9/24 | 17/9/24  | White board |  |
| 23 | Absolute convergence                                                   | Unit 2 | 18/9/24 | 18/9/24  | White board |  |
| 24 | Leibnitz's Rule (without Proof).                                       | Unit 2 | 19/9/24 | 19/9/24  | White board |  |
| 25 | De Moivre's theorem                                                    | Unit 3 | 23/9/24 | 23/9/24  | White board |  |
| 26 | roots of complex numbers                                               | Unit 3 | 24/9/24 | 24/9/24  | White board |  |
| 27 | Expansion of $\sin n\theta$ , $\cos n\theta$                           | Unit 3 | 25/9/24 | 25/9/24  | White board |  |
| 28 | $\tan n\theta$ in powers of $\sin\theta$ , $\cos\theta$ , $\tan\theta$ | Unit 3 | 26/9/24 | 26/9/24  | White board |  |
| 29 | Complex trigonometry functions                                         | Unit 3 | 28/9/24 | 28/9/24  | White board |  |
| 30 | hyperbolic functions                                                   | Unit 3 | 30/9/24 | 30/9/24  | White board |  |
| 31 | Inverse hyperbolic functions                                           | Unit 3 | 1/10/24 | 01/10/24 | White board |  |
| 32 | Logarithm of complex numbers                                           | Unit 3 | 3/10/24 | 3/10/24  | White board |  |
| 33 | Summation of trigonometric series.                                     | Unit 3 | 4/10/24 | 04/10/24 | White board |  |

*Mamale*



|    |                                                 |        |          |          |             |  |
|----|-------------------------------------------------|--------|----------|----------|-------------|--|
| 34 | Successive differentiation                      | Unit 4 | 7/10/24  | 7/10/24  | White board |  |
| 35 | Leibnitz theorem                                | Unit 4 | 8/10/24  | 8/10/24  | White board |  |
| 36 | Leibnitz theorem and applications               | Unit 4 | 9/10/24  | 9/10/24  | White board |  |
| 37 | Taylor's and Maclaurin's series (without Proof) | Unit 4 | 10/10/24 | 10/10/24 | White board |  |
| 38 | Functions of two or more variables              | Unit 4 | 14/10/24 | 14/10/24 | White board |  |
| 39 | limit and continuity                            | Unit 4 | 16/10/24 | 16/10/24 | White board |  |
| 40 | Partial derivatives.                            | Unit 4 | 17/10/24 | 17/10/24 | White board |  |
| 41 | Total differential                              | Unit 4 | 4/11/24  | 4/11/24  | White board |  |
| 42 | Differentiability                               | Unit 4 | 11/11/24 | 11/11/24 | White board |  |
| 43 | Derivatives of composite                        | Unit 4 | 12/11/24 | 12/11/24 | White board |  |
| 44 | implicit functions                              | Unit 4 | 13/11/24 | 12/11/24 | White board |  |
| 45 | Higher order partial derivatives                | Unit 5 | 13/11/24 | 13/11/24 | White board |  |
| 46 | Homogeneous functions                           | Unit 5 | 14/11/24 | 14/11/24 | White board |  |
| 47 | Homogeneous functions and applications          | Unit 5 | 22/11/24 | 22/11/24 | White board |  |
| 48 | Euler's Theorem                                 | Unit 5 | 23/11/24 | 25/11/24 | White board |  |



*Manual*

|            |                                                     |        |          |          |             |  |
|------------|-----------------------------------------------------|--------|----------|----------|-------------|--|
| 4<br>9     | Jacobians                                           | Unit 5 | 26/11/24 | 25/11/24 | White board |  |
| 5<br>0     | Maxima-minima of function of two variables          | Unit 5 | 26/11/24 | 26/11/24 | White board |  |
| 5<br>1     | Lagrange's method of undetermined multipliers       | Unit 5 | 27/11/24 | 26/11/24 | White board |  |
| 5<br>2     | Differentiation under integral sign (Leibnitz rule) | Unit 5 | 28/11/24 | 28/11/24 | White board |  |
| 5<br>3     | Curve tracing.                                      | Unit 5 | 29/11/24 | 27/11/24 | White board |  |
| 5<br>4     | Curvature                                           | Unit 5 | 29/11/24 | 27/11/24 | White board |  |
| 55/56<br>5 | Asymptotes                                          | Unit 5 | 29/11/24 | 28/11/24 | White board |  |

Total = 55 Lectures

Signature of faculty

*Mamun*



**School of Engineering & Technology, Sushant University**

**Odd Semester (August-December) 2024**

**Students List**

**Program: B.Tech**

**Sem: I**

**Course Name: Mathematics I**

**Course Code: 23BTC-0MA11T**

**Faculty: Dr. Manimala**

**Total No. of Students enrolled in the course: 103**

| Student Name        | Roll No      |
|---------------------|--------------|
| AARTI NEGI          | 240BTCCSE029 |
| AARYAN KASHYAP      | 240BTCCSE033 |
| AASHI THAKRAN       | 240BTCCSE020 |
| ABHINAV RANGA       | 240BTCCSE087 |
| ADITYA CHAUDHARY    | 240BTCCSE091 |
| AKSHAT SHUKLA       | 240BTCCSE007 |
| AKSHIT MATHUR       | 240BTCCSE079 |
| ANKIT NAGAR         | 240BTCCSE081 |
| Anuj kumar          | 240BTCCSE115 |
| ANUPRIYA            | 240BTCCSE077 |
| ARAV                | 240BTCCSE043 |
| ARKISH DAHIYA       | 240BTCCSE032 |
| ARMAAN SAIFI        | 240BTCCSE062 |
| ARPIT KUMAR         | 240BTCCSE023 |
| ARYAN KUMAR         | 240BTCCSE063 |
| ARYAN NAPIT         | 240BTCCSE016 |
| ASHANK SHARMA       | 240BTCCSE053 |
| ASHISH KUMAR SHARMA | 240BTCCSE047 |
| ASTIK GUPTA         | 240BTCCSE008 |
| ATHARV MALIK        | 240BTCCSE059 |
| AVNISH              | 240BTCCSE054 |
| AYESHA GUPTA        | 240BTCCSE009 |
| BHAVIK              | 240BTCCSE038 |
| BHAVIK CHAWLA       | 240BTCCSE038 |
| DEEKSHA SORAJ       | 240BTCCSE080 |
| DEEPAK PHOGAT       | 240BTCCSE109 |
| DHRUV               | 240BTCCSE022 |
| DHRUV YADAV         | 240BTCCSE108 |



*Manimala*

|                          |              |
|--------------------------|--------------|
| Dishant                  | 240BTCCSE106 |
| DIVYANSH Kaushik         | 240BTCCSE066 |
| DIVYANSHU RANA           | 240BTCCSE057 |
| DRISHIKA ANEJA           | 240BTCCSE003 |
| FAIZAN KHAN              | 240BTCCSE044 |
| HARSH SHARMA             | 240BTCCSE065 |
| HARSHIT CHHILLAR         | 240BTCCSE026 |
| HARSHIT KUMAR PANDEY     | 240BTCCSE018 |
| HIMANSHU KUMAR CHAUDHARY | 240BTCCSE030 |
| JAI KUMAR JHA            | 240BTCCSE036 |
| JATIN RANA               | 240BTCCSE089 |
| JAYANT GAUR              | 240BTCCSE017 |
| KANISHK GAUR             | 240BTCCSE013 |
| KANISHKA                 | 240BTCCSE042 |
| KANISHKA SRIVASTAVA      | 240BTCCSE037 |
| KAUSHAL YADAV            | 240BTCCSE078 |
| KRISHNA GEMINI           | 240BTCCSE069 |
| KRRISH SHARMA            | 240BTCCSE090 |
| KUMAR ANKIT              | 240BTCCSE117 |
| Kumar Aryan              | 240BTCCSE055 |
| KUNAL JOON .             | 240BTCCSE050 |
| KYATHIKA RAO SEELAM      | 240BTCCSE046 |
| LAKSHITA                 | 240BTCCSE119 |
| MANAN KOCHAR             | 240BTCCSE113 |
| MAYANK KAUSHIK           | 240BTCCSE012 |
| MAYANK RATHORE           | 240BTCCSE051 |
| MAYANK SHARMA            | 240BTCCSE070 |
| MOHD HAMZA               | 240BTCCSE085 |
| MOHIT                    | 240BTCCSE014 |
| NARESH KUMAR             | 240BTCCSE025 |
| NEERAJ RANA              | 240BTCCSE118 |
| NIHAL                    | 240BTCCSE001 |
| NIKHIL PATEL             | 240BTCCSE021 |
| PALAK SHRIVASTAV         | 240BTCCSE024 |
| PARINEETA                | 240BTCCSE048 |
| Payal Yadav              | 240BTCCSE136 |
| PIYUSH CHOUBEY           | 240BTCCSE005 |
| POORAV YADAV             | 240BTCCSE076 |
| PRAGYA                   | 240BTCCSE071 |
| PRASHANT SHARMA          | 240BTCCSE028 |
| PRINCE BHARDWAJ          | 240BTCCSE004 |



*Manish*

|                   |              |
|-------------------|--------------|
| RAHUL SEHRAWAT    | 240BTCCSE107 |
| RAJ ARYAN         | 240BTCCSE116 |
| RISHI             | 240BTCCSE121 |
| RITESH KUMAR      | 240BTCCSE060 |
| RITESH MAAN       | 240BTCCSE052 |
| ROSSANE HENRICK   | 240BTCCSE002 |
| RUPESH            | 240BTCCSE088 |
| SAARA TEWATHIA    | 240BTCCSE006 |
| SAMEER PAHWA      | 240BTCCSE086 |
| SAMEER VATS       | 240BTCCSE093 |
| SANA GHOSH        | 240BTCCSE058 |
| SANJEEV KUMAR     | 240BTCCSE074 |
| SARTHAK MEHTA     | 240BTCCSE040 |
| SARTHAK PANDAY    | 240BTCCSE056 |
| Shiv Kumar Ray    | 240BTCCSE084 |
| SHUBHAM LOHIA     | #N/A         |
| SHUBHAM TANWAR    | 240BTCCSE114 |
| SOHAM VERMA       | 240BTCCSE010 |
| SRITARA           | 240BTCCSE092 |
| SUHANI            | 240BTCCSE039 |
| TAKSH ROOP        | 240BTCCSE015 |
| TANISHKA GUPTA    | 240BTCCSE049 |
| TANIYA MALIK      | 240BTCCSE075 |
| UNNATI            | 240BTCCSE067 |
| VARSHA            | 240BTCCSE035 |
| Vipin Singh Yadav | 240BTCCSE083 |
| YASH              | 240BTCCSE134 |
| YASH KUMAR        | 240BTCCSE031 |
| YASH YADAV        | 240BTCCSE034 |
| YUVANSH           | 240BTCCSE011 |

*Signature*



Study Material:- ~~En~~ Mathematics -I (23BTC-0MA11T)

[https://drive.google.com/drive/folders/1YmixQZiB-lQ7sXvBVZ\\_hKMtqghBPQQp8?usp=drive\\_link](https://drive.google.com/drive/folders/1YmixQZiB-lQ7sXvBVZ_hKMtqghBPQQp8?usp=drive_link)

1. Books
2. Recorded lectures
3. Clats. Notes
4. Assignment
5. Quiz.

Manual 9



## Eigenvalues & Eigenvectors

Let  $A = [a_{ij}]_{n \times n}$  be a square matrix of order  $n$ ,  $I$  an unit matrix of order  $n$  &  $\lambda$  an <sup>or scalar</sup> indeterminate. then the matrix

$$A - \lambda I = \begin{bmatrix} a_{11} - \lambda & a_{12} & \dots & a_{1n} \\ a_{21} & a_{22} - \lambda & \dots & a_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ a_{n1} & a_{n2} & \dots & a_{nn} - \lambda \end{bmatrix} = \lambda \begin{bmatrix} 1 & 0 & 0 & \dots & 0 \\ 0 & 1 & 0 & \dots & 0 \\ \vdots & \vdots & \vdots & \ddots & \vdots \\ 0 & 0 & 0 & \dots & 1 \end{bmatrix}$$

$$\begin{bmatrix} a_{11} - \lambda & a_{12} & \dots & a_{1n} \\ a_{21} & a_{22} - \lambda & \dots & a_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ a_{n1} & a_{n2} & \dots & a_{nn} - \lambda \end{bmatrix}$$

is called the characteristic matrix of  $A$  & the determinant

$$|A - \lambda I| = \begin{vmatrix} a_{11} - \lambda & a_{12} & \dots & a_{1n} \\ a_{21} & a_{22} - \lambda & \dots & a_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ a_{n1} & a_{n2} & \dots & a_{nn} - \lambda \end{vmatrix}$$
 is called the characteristic

polynomial of  $\lambda$ .

Also the equation  $|A - \lambda I| = 0$  is called the characteristic equation of  $A$ . The roots of this eqn. are called characteristic roots or characteristic values or eigen values or eigen roots or latent roots of the matrix.

If  $\lambda$  is a characteristic roots of a non matrix  $A$ , then the non zero soln

$X = \begin{bmatrix} x_1 \\ x_2 \\ \vdots \end{bmatrix}$  of the eqn.  $AX = \lambda X$  or  $(A - \lambda I)X = 0$  is called the characteristic vector or eigen vector of the

matrix  $A$  corresponding to the characteristic root  $\lambda$ .

Some Important properties of Eigenvalues :-

(a) Any matrix  $A$  & its transpose both have the same eigen values.

(b) The trace of the matrix equals to the sum of the eigen values of a matrix.

Note :- The sum of the elements on the principal diagonal of a matrix is ~~equal~~ called the trace of the matrix.

(c) The determinant of the matrix  $A$  equals to the product of the eigen values of  $A$ .

(d) If  $\lambda_1, \lambda_2, \dots, \lambda_n$  are  $n$ -eigen values of  $A$ , then

(i) Eigen values of  $KA$  are  $k\lambda_1, k\lambda_2, \dots, k\lambda_n$ .

(ii) Eigen " "  $A^{-1}$  are  $\frac{1}{\lambda_1}, \frac{1}{\lambda_2}, \dots, \frac{1}{\lambda_n}$ .

(iii) Eigen values of  $A^m$  "  $\lambda_1^m, \lambda_2^m, \dots, \lambda_n^m$ .

(e) If  $\lambda$  is an eigen of a matrix  $A$ , then  $\frac{1}{\lambda}$  is the eigen values of  $A^{-1}$ .

(f) If  $\lambda_1, \lambda_2, \dots, \lambda_n$  are eigen values of a matrix  $A$ , then  $A^m$  has the eigen values  $\lambda_1^m, \lambda_2^m, \dots, \lambda_n^m$ ,  $m$  being a +ve integer.





Q.1

The matrix A is defined as  $A = \begin{bmatrix} 1 & 2 & -3 \\ 0 & 3 & 2 \\ 0 & 0 & -2 \end{bmatrix}$

Find the eigenvalues of  $3A^3 + 5A^2 - 6A + 2I$

Soln

$$|A - \lambda I| = 0$$

$$\begin{vmatrix} 1-\lambda & 2 & -3 \\ 0 & 3-\lambda & 2 \\ 0 & 0 & -2-\lambda \end{vmatrix} = 0$$

$$(1-\lambda)(3-\lambda)(-2-\lambda) = 0 \Rightarrow \lambda = 1, 3, -2$$

eigenvalues of  $A^3 = 1, 27, -8$

" "  $A^2 = 1, 9, 4$

" "  $A = 1, 3, -2$

" "  $I = 1, 1, 1$

$\therefore$  eigenvalues of  $3A^3 + 5A^2 - 6A + 2I$

$$1^{st} \text{ eigenvalue} = 3(1)^3 + 5(1)^2 - 6(1) + 2(1) = 3 + 5 - 6 + 2 = 4$$

$$\text{Second} = 3(27) + 5(9) - 6(3) + 2(1) = 110$$

$$\text{Third} = 3(-8) + 5(4) - 6(-2) + 2(1) = 10$$

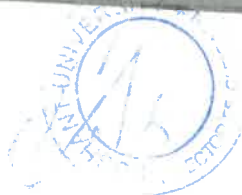
$\therefore$  Required eigenvalues are 4, 110, 10

Q.2

Show that for any square matrix A, the product of all the eigenvalues of A is equal to  $\det(A)$ , and the sum of all the eigenvalues of A is equal to the sum of the diagonal elements.

Soln: let  $A = \begin{bmatrix} a_{11} & a_{12} & a_{13} \\ a_{21} & a_{22} & a_{23} \\ a_{31} & a_{32} & a_{33} \end{bmatrix}$   $|A - \lambda I| = 0$   $\begin{vmatrix} a_{11}-\lambda & a_{12} & a_{13} \\ a_{21} & a_{22}-\lambda & a_{23} \\ a_{31} & a_{32} & a_{33}-\lambda \end{vmatrix}$

$$\begin{aligned} |A - \lambda I| &= -\lambda^3 + \lambda^2(a_{11} + a_{22} + a_{33}) + \lambda \{ -a_{11}a_{22} - a_{11}a_{33} + \\ &\quad a_{12}a_{21} - a_{22}a_{33} + \\ &\quad a_{23}a_{32} + a_{33}a_{31} \} \\ &\quad + (a_{11}(a_{22}a_{33} - a_{23}a_{32}) - a_{12}(a_{21}a_{33} - a_{23}a_{31}) \\ &\quad + a_{13}(a_{21}a_{32} - a_{22}a_{31})) \end{aligned}$$



If  $\lambda_1, \lambda_2, \lambda_3$  be the roots of eq: ① then  
 Sum of roots  $= \lambda_1 + \lambda_2 + \lambda_3 = a_{11} + a_{22} + a_{33} = \text{Sum of diagonal elements}$   
 Product of roots  
 $= \lambda_1 \lambda_2 \lambda_3 = \begin{vmatrix} a_{11} & a_{12} & a_{13} \\ a_{21} & a_{22} & a_{23} \\ a_{31} & a_{32} & a_{33} \end{vmatrix} = \text{Determinant of } A$

Q. Prove that a matrix  $A$  & its transpose  $A'$  have the same characteristic roots.

Soln Characteristic eq. of matrix  $A$  is

$$|A - \lambda I| = 0 \quad \text{--- (1)}$$

Char. eq. of matrix  $A'$  is

$$|A' - \lambda I| = 0 \quad \text{--- (2)}$$

Clearly both (1) & (2) are same as we know that

$|A| = |A'|$   
 i.e. a determinant remains unchanged when rows are changed into columns & columns into rows.

Q. Show that characteristic roots of triangular matrix are just the diagonal elements of the matrix.

Soln:- Let us consider the triangular matrix

$$A = \begin{bmatrix} a_{11} & 0 & 0 & 0 \\ a_{21} & a_{22} & 0 & 0 \\ a_{31} & a_{32} & a_{33} & 0 \\ a_{41} & a_{42} & a_{43} & a_{44} \end{bmatrix}$$

$$\text{Char. eq. is } |A - \lambda I| = 0 \quad \begin{vmatrix} a_{11} - \lambda & 0 & 0 & 0 \\ a_{21} & a_{22} - \lambda & 0 & 0 \\ a_{31} & a_{32} & a_{33} - \lambda & 0 \\ a_{41} & a_{42} & a_{43} & a_{44} - \lambda \end{vmatrix} = 0$$

On expansion it gives  $(a_{11} - \lambda)(a_{22} - \lambda)(a_{33} - \lambda)(a_{44} - \lambda) = 0$   
 which are diagonal elements of  $A$  i.e.  $a_{11}, a_{22}, a_{33}, a_{44}$ .



Find the eigen values & eigenvectors of the matrix  $A = \begin{bmatrix} 5 & 4 \\ 1 & 2 \end{bmatrix}$

Soln The characteristic eqn. of the given matrix is

$$|A - \lambda I| = 0$$

$$\text{i.e. } \begin{vmatrix} 5-\lambda & 4 \\ 1 & 2-\lambda \end{vmatrix} = 0$$

$$\Rightarrow (5-\lambda)(2-\lambda) - 4 = 0$$

$$\Rightarrow 10 - 5\lambda - 2\lambda + \lambda^2 - 4 = 0$$

$$\Rightarrow \lambda^2 - 7\lambda + 6 = 0 \Rightarrow (\lambda - 6)(\lambda - 1) = 0$$

$$\Rightarrow \lambda = 6, 1$$

$\therefore$  eigen values of  $A$  are 1 & 6

Let  $x_1, x_2$  be the components of an eigen vector corresponding to the eigen value  $\lambda$ , then

$$[A - \lambda I]x = \begin{bmatrix} 5-\lambda & 4 \\ 1 & 2-\lambda \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} = 0$$

(i) When  $\lambda = 6$ , the corresponding eigen vector is given by

$$\begin{bmatrix} 5-6 & 4 \\ 1 & 2-6 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} = 0$$

$$\text{i.e. } \begin{bmatrix} -1 & 4 \\ 1 & -4 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} = 0$$

which gives only one independent eqn.

$$\Rightarrow -x_1 + 4x_2 = 0$$

$$\Rightarrow \frac{x_1}{4} = \frac{x_2}{1} = k \text{ given the eigen vector } (4, 1)$$

$$x_1 = 4k$$

$$x_2 = k$$

$\therefore$  eigen vector  $\begin{bmatrix} 4k \\ k \end{bmatrix}$   
or  $\begin{bmatrix} 4 \\ 1 \end{bmatrix}$

(ii) when  $\lambda = 1$  the corresponding eigen vector is  $\underline{g}$

$$\begin{bmatrix} 5-1 & 4 \\ 1 & 2-1 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} = 0$$

$$\begin{bmatrix} 4 & 4 \\ 1 & 1 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} = 0$$

which gives only independent eqn.

$$x_1 + x_2 = 0$$

$$\frac{x_1}{1} = \frac{-x_2}{-1} \text{ i.e. giving the}$$

eigen vector  $(1, -1)$

2002  
only 05

Q3. Find the eigen values & eigen vector of matrix

$$A = \begin{bmatrix} 3 & 1 & 4 \\ 0 & 2 & 6 \\ 0 & 0 & 5 \end{bmatrix}$$

The characteristic eqn. of the given matrix is

$$|A - \lambda I| = 0$$

$$\Rightarrow \begin{vmatrix} 3-\lambda & 1 & 4 \\ 0 & 2-\lambda & 6 \\ 0 & 0 & 5-\lambda \end{vmatrix} = 0$$

$$\Rightarrow (3-\lambda)(2-\lambda)(5-\lambda) = 0$$

$$\Rightarrow \lambda = 2, 3, 5$$

Thus the eigen values of A are 2, 3, 5

(i) Corresponding to  $\lambda = 2$  the

(ii) When  $\lambda = 2$ , the corresponding eigen vector is given by

$$\begin{bmatrix} 3-2 & 1 & 4 \\ 0 & 2-2 & 6 \\ 0 & 0 & 5-2 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} = \begin{bmatrix} 0 \\ 0 \\ 0 \end{bmatrix}$$

**School of Engineering & Technology, Sushant University**

**Assignment –Odd Semester (August-December) 2024**

Program: B.Tech

Course Name: Mathematics I

Faculty: Dr. Manimala

Submission Deadline:

Semester: I

Course Code: 23BTCCSE0MA11T

Maximum Marks: 10

**Course Outcomes**

- CO1: Describe matrix algebra to solving engineering problems. Determine the eigenvalues and eigenvectors of a matrix
- CO2: Distinguish between the concepts of sequence and series. Determine convergence and divergence of series. Understand De Moivre's theorem and find the roots of complex numbers. Application of complex numbers for solving engineering problems.
- CO3: Understand application of Leibniz's theorem & Taylor's theorem in real life problems. Demonstrate Knowledge of maxima and minima of function of two variables, Understand Homogeneous Function.

Q1 (CO1).

Find the rank of matrix  $A = \begin{bmatrix} 3 & -1 & 2 & -6 & 2 & 4 & -3 & 1 & 2 \end{bmatrix}$  by reducing it in normal form.

Q (CO 2)

Define absolutely convergence & conditionally convergence of an infinite series. Test the following series for convergence and absolutely convergence:

$$\frac{1}{1.3} - \frac{1}{2.4} + \frac{1}{3.5} - \frac{1}{4.6} + \dots \dots \dots \infty$$

Q3 (CO 2)

Show that the nth roots of unity are given by  $1, \gamma, \gamma^2, \gamma^3, \dots, \gamma^{n-1}$  where  $\gamma = \cos \frac{2\pi}{n} + i \sin \frac{2\pi}{n}$  and

that the continued product of all the nth roots is  $(-1)^{n+1}$ .

Q4 (CO 3)

If  $u = x^2 \sin \frac{y}{x}$ , find  $\frac{\partial u}{\partial x}$  &  $\frac{\partial u}{\partial y}$ .

Q5 (CO 1)

Solve the following system of equation by matrix method:

$$x + y + z = 1, \quad 2x - y + z = 4, \quad x - 3y - 2z = 2.$$

Q6 (CO 1)

Find the eigen values and the corresponding eigen vectors of the matrix  $A = \begin{bmatrix} 3 & 1 & 4 & 0 & 2 & 0 & 0 & 5 \end{bmatrix}$ .

Q7 (CO 1)

Find the characteristic equation of the matrix  $A = \begin{bmatrix} 2 & 1 & 1 & 0 & 1 & 0 & 1 & 1 & 2 \end{bmatrix}$  and hence, find the matrix represented by  $A^8 - 5A^7 + 7A^6 - 3A^5 + A^4 - 5A^3 + 8A^2 - 2A + I$ .

Q8 (CO 3)

State Leibnitz's Theorem. If  $y = (\sin^{-1} x)^2$ , prove that  $(1 - x^2)y_{n+2} - (2n + 1)xy_{n+1} - n^2y_n = 0$ .



*Manimala*

Q9 (CO 3)

If  $u = \tan^{-1} \frac{x^3 + y^3}{x - y}$ , prove that  $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} = \sin 2u$ .

Q10(CO 2)

Test the convergence of the series :  $\sum_{n=1}^{\infty} \frac{(n+1)^n x^n}{n^{n+1}}$ .

Q11(CO 2)

Test the convergence of the series :  $\frac{1}{2} + \frac{1}{3} + \frac{1}{5} + \dots + \frac{1}{2^{n-1}+1} + \dots$

Q12 (CO1)

Use Gauss Jordan method to find the inverse of the matrix  $A = \begin{bmatrix} 1 & 2 & 5 & 2 & 3 & 1 \\ - & 1 & 1 & 1 \end{bmatrix}$ .

Q13 (CO2)

Find the different values of  $(1 + i)^{\frac{1}{3}}$ .

*Mansingh*



SUSHANT UNIVERSITY, GURGAON

QUIZ 1

15BTC-1MA12T: Engineering Mathematics I

Program: B. Tech (all branch)

Semester: 1<sup>st</sup>

Time: 40 min.

Max Marks: 15

Instructions: Question 1 is compulsory. Attempt any two questions from Q2 to Q4.

Q1. Find the eigen values and eigen vectors of the matrix  $A = \begin{bmatrix} -2 & 2 & -3 \\ 2 & 1 & -6 \\ -1 & -2 & 0 \end{bmatrix}$ . (5 marks) CO<sub>1</sub>

Q2. Using Gauss Jordan method, find the inverse of the given matrix A,

where  $A = \begin{bmatrix} 2 & 1 & -1 \\ 0 & 2 & 1 \\ 5 & 2 & -3 \end{bmatrix}$ . (5 marks) CO<sub>1</sub>

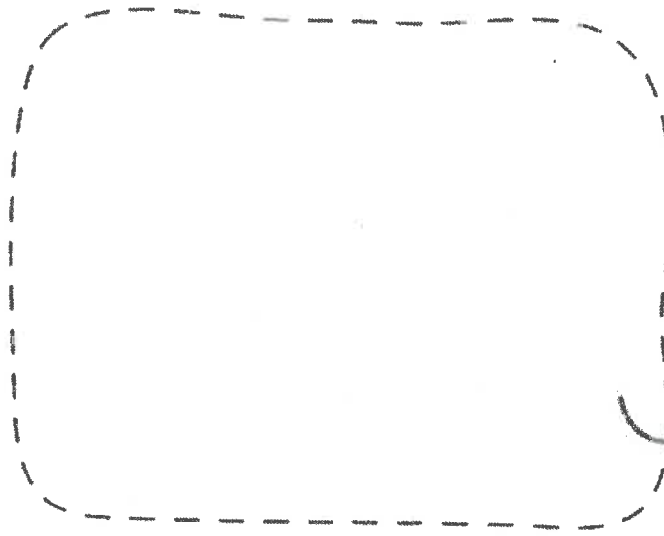
Q3. Find the rank of given matrix  $\begin{bmatrix} 8 & 1 & 3 & 6 \\ 0 & 3 & 2 & 2 \\ -8 & -1 & -3 & 4 \end{bmatrix}$  reducing it in normal form (5 marks) CO<sub>1</sub>

Q4. Are the following vectors linearly dependent? If so, find a relation between them

$x_1 = (1, 2, 1)$ ,  $x_2 = (2, 1, 4)$ ,  $x_3 = (4, 5, 6)$  (5 marks) CO<sub>1</sub>

*Manish*





INSERT  
DOODLED  
SELFIE  
HERE

MATHS

ASSIGNMENT  
COPY

NAME UNNATI Sec- B

ADDRESS Roll No - 240BTCCSE067

MOBILE \_\_\_\_\_

EMAIL \_\_\_\_\_

EMERGENCY CONTACT \_\_\_\_\_



*[Handwritten signature]*

11

\_/\_/\_

## Assignment - 1

Que  $\rightarrow$  Reduce to triangular form

i) 
$$\begin{bmatrix} 3 & -4 & -5 \\ -9 & 1 & 4 \\ -5 & 3 & 1 \end{bmatrix}$$

Soln

$$R_2 \rightarrow R_2 + 3R_1$$

$$\begin{bmatrix} 3 & -4 & -5 \\ 0 & -11 & -11 \\ -5 & 3 & 1 \end{bmatrix}$$

$$R_3 \rightarrow R_3 + \frac{5}{3}R_1$$

$$\begin{bmatrix} 3 & -4 & -5 \\ 0 & -11 & -11 \\ 0 & -11/3 & -22/3 \end{bmatrix}$$

$$R_3 \rightarrow R_3 - \frac{1}{3}R_2$$

$$\begin{bmatrix} 3 & -4 & -5 \\ 0 & -11 & -11 \\ 0 & 0 & -11/3 \end{bmatrix}$$

ii)

$$\begin{bmatrix} 2 & 3 & -1 \\ 0 & -3 & 2 \\ -5 & 3 & 7 \end{bmatrix}$$

$$R_3 \rightarrow R_3 + \frac{5}{2}R_1$$

$$R_2 \rightarrow R_2 - R_1$$

$$\begin{bmatrix} 8 & 4 & 3 \\ 0 & 0 & 1 \\ 0 & 3 & 3 \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 \\ -1 & 4 & 0 \\ 0 & -1 & 2 \end{bmatrix} A$$

$$R_2 \rightarrow R_2 + R_3$$

$$R_3 \rightarrow R_3 - R_2$$

$$\begin{bmatrix} 8 & 4 & 3 \\ 0 & 3 & 4 \\ 0 & 0 & -1 \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 \\ -1 & 3 & 2 \\ 1 & -4 & 0 \end{bmatrix} A$$

$$R_1 \rightarrow R_1 + 3R_2$$

$$R_2 \rightarrow R_2 + 4R_3$$

$$\begin{bmatrix} 8 & 4 & 0 \\ 0 & 3 & 0 \\ 0 & 0 & -1 \end{bmatrix} = \begin{bmatrix} 4 & -12 & 0 \\ 3 & -13 & 2 \\ 1 & -4 & 0 \end{bmatrix} A$$

$$R_1 \rightarrow R_1 - \frac{4}{3} R_2$$

$$\begin{bmatrix} 8 & 0 & 0 \\ 0 & 3 & 0 \\ 0 & 0 & -1 \end{bmatrix} = \begin{bmatrix} 0 & 16/3 & -8/3 \\ 3 & -13 & 2 \\ 1 & -4 & 0 \end{bmatrix} A$$

$$R_1 \rightarrow 1/8 R_1 \quad R_2 \rightarrow 1/3 R_2 \quad R_3 = -R_3$$

$$\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix} = \begin{bmatrix} 0 & 2/3 & -1/3 \\ 1 & -13/3 & 2/3 \\ -1 & 4 & 0 \end{bmatrix} A$$

$$A^{-1} = \begin{bmatrix} 0 & 2/3 & -1/3 \\ 1 & -13/3 & 2/3 \\ -1 & 4 & 0 \end{bmatrix}$$

$$A^{-1} = \begin{bmatrix} 3 & -1 & 1 \\ -15 & 6 & -5 \\ 5 & -2 & 2 \end{bmatrix}$$

iii)  $\begin{bmatrix} 2 & 1 & -1 \\ 0 & 2 & 1 \\ 5 & 2 & 3 \end{bmatrix}$

$$\begin{bmatrix} 2 & 1 & -1 \\ 0 & 2 & 1 \\ 5 & 2 & 3 \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix} A$$

$$R_1 \rightarrow 1/2 R_1$$

$$R_3 \rightarrow R_3 - 5R_1$$

$$\begin{bmatrix} 1 & 1/2 & -1/2 \\ 0 & 2 & 1 \\ 0 & -1/2 & -1/2 \end{bmatrix} = \begin{bmatrix} 1/2 & 0 & 0 \\ 0 & 1 & 0 \\ -5/2 & 0 & 1 \end{bmatrix} A$$

$$R_2 \rightarrow 1/2 R_2, R_1 \rightarrow R_1 - 1/2 R_2, R_3 \rightarrow R_3 + 1/2 R_2$$

$$\begin{bmatrix} 1 & 0 & -3/4 \\ 0 & 1 & 1/2 \\ 0 & 0 & -1/4 \end{bmatrix} = \begin{bmatrix} 1/2 & -1/4 & 0 \\ 0 & 1/2 & 0 \\ -5/2 & 1/4 & 1 \end{bmatrix} A$$

$$R_3 \rightarrow -4R_3$$

$$\begin{bmatrix} 1 & 0 & -3/4 \\ 0 & 1 & 1/2 \\ 0 & 0 & 1 \end{bmatrix} = \begin{bmatrix} 1/2 & -1/4 & 0 \\ 0 & 1/2 & 0 \\ 10 & -1 & -4 \end{bmatrix} A$$

$$R_3 \rightarrow -\frac{1}{4} R_3$$

$$\begin{bmatrix} 1 & 1 & 3 \\ 0 & 1 & -3 \\ 0 & 0 & 1 \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 \\ -1/2 & 1/2 & 0 \\ -1/4 & -1/4 & -1/4 \end{bmatrix} A$$

$$R_1 \rightarrow R_1 - 3R_3, \quad R_2 \rightarrow R_2 + 3R_3$$

$$\begin{bmatrix} 1 & 1 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix} = \begin{bmatrix} 7/4 & 3/4 & 3/4 \\ -5/4 & -1/4 & -3/4 \\ -1/4 & -1/4 & -1/4 \end{bmatrix} A$$

$$R_1 \rightarrow R_1 - R_2$$

$$\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix} = \begin{bmatrix} 3 & 1 & 3/2 \\ -5/4 & -1/4 & -3/4 \\ -1/4 & -1/4 & -1/4 \end{bmatrix}$$

$$A^{-1} = \begin{bmatrix} 3 & 1 & 3/2 \\ -5/4 & -1/4 & -3/4 \\ -1/4 & -1/4 & -1/4 \end{bmatrix}$$

ii)  $\begin{bmatrix} 3 & -3 & 4 \\ 2 & -3 & 4 \\ 0 & -1 & 1 \end{bmatrix}$

$$\begin{bmatrix} 3 & -3 & 4 \\ 2 & -3 & 4 \\ 0 & -1 & 1 \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix} A$$

$$R_1 \rightarrow R_1 - R_2, \quad R_2 \rightarrow R_2 - 4R_3$$

$$\begin{bmatrix} 1 & 2 & 5 \\ 0 & -1 & -9 \\ 0 & 3 & 6 \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 \\ -2 & 1 & 0 \\ 1 & 0 & 1 \end{bmatrix} A$$

$$R_2 \rightarrow -R_2$$

$$R_3 \rightarrow 1/3 R_3$$

$$\begin{bmatrix} 1 & 2 & 5 \\ 0 & 1 & 9 \\ 0 & 1 & 2 \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 \\ 2 & -1 & 0 \\ 1/3 & 0 & 1/3 \end{bmatrix} A$$

$$R_1 \rightarrow R_1 - 2R_2, R_3 \rightarrow R_3 - R_2$$

$$\begin{bmatrix} 1 & 0 & -13 \\ 0 & 1 & 9 \\ 0 & 0 & -7 \end{bmatrix} = \begin{bmatrix} -3 & 2 & 0 \\ 2 & -1 & 0 \\ -5/3 & 1 & 1/3 \end{bmatrix} A$$

$$R_3 \rightarrow -1/7 R_3$$

$$\begin{bmatrix} 1 & 0 & -13 \\ 0 & 1 & 9 \\ 0 & 0 & 1 \end{bmatrix} = \begin{bmatrix} -3 & 2 & 0 \\ 2 & -1 & 0 \\ -5/21 & -1/7 & 1/21 \end{bmatrix} A$$

$$R_2 \rightarrow R_2 - 9R_3$$

$$R_1 \rightarrow R_1 + 13R_3$$

$$\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix} = \begin{bmatrix} 2/21 & 1/7 & 13/21 \\ -1/7 & 2/7 & 3/7 \\ 5/21 & -1/7 & -1/21 \end{bmatrix} A$$

$$A^{-1} = \begin{bmatrix} 2/21 & 1/7 & -13/21 \\ -1/7 & 2/7 & 3/7 \\ 5/21 & -1/7 & -1/21 \end{bmatrix}$$

$$R_1 \rightarrow R_1 - R_3$$

$$\begin{bmatrix} 0 & 0 & 0 & 2 \\ 3 & 9 & 12 & 3 \\ 1 & 3 & 4 & 1 \end{bmatrix}$$

$$R_2 \rightarrow R_2 - 3R_3$$

$$\begin{bmatrix} 0 & 0 & 0 & 2 \\ 0 & 0 & 0 & 0 \\ 1 & 3 & 4 & 1 \end{bmatrix}$$

$$\rho(A) = 2$$

(no. of non-zero rows = 2)

iv)

$$\begin{bmatrix} 1 & 4 & 5 \\ 2 & 6 & 8 \\ 3 & 7 & 22 \end{bmatrix}$$

$$R_2 \rightarrow R_2 - 2R_1$$

$$\begin{bmatrix} 1 & 4 & 5 \\ 0 & -2 & -2 \\ 3 & 7 & 22 \end{bmatrix}$$

$$R_3 \rightarrow R_3 - 3R_1$$

$$\begin{bmatrix} 1 & 4 & 5 \\ 0 & -2 & -2 \\ 0 & -5 & 7 \end{bmatrix}$$

$$R_2 \rightarrow -1/2 R_2$$



$$R_3 \rightarrow R_3 - 2R_2$$

$$A = \begin{bmatrix} 3 & -1 & 2 \\ 0 & 0 & 4 \\ 0 & 0 & 0 \end{bmatrix}$$

$$R_1 \rightarrow \frac{1}{3} R_1, \quad R_2 \rightarrow \frac{1}{4} R_2$$

$$A = \begin{bmatrix} 1 & -1/3 & 2/3 \\ 0 & 0 & 1 \\ 0 & 0 & 0 \end{bmatrix}$$

$$\rho(A) = 2$$

Ans  $\rightarrow$   $\begin{bmatrix} 3 & -1 & 2 \\ -6 & 2 & 4 \\ -3 & 1 & 2 \end{bmatrix}$

Sol<sup>n</sup>

$$\begin{aligned} R_3 &\rightarrow R_3 + R_1 \\ R_2 &\rightarrow R_2 + 2R_1 \end{aligned}$$

$$\begin{bmatrix} 3 & -1 & 2 \\ 0 & 0 & 8 \\ 0 & 0 & 4 \end{bmatrix}$$

$$R_3 \rightarrow 2R_3 - R_2$$

$$\begin{bmatrix} 3 & -1 & 2 \\ 0 & 0 & 8 \\ 0 & 0 & 0 \end{bmatrix}$$



*[Handwritten signature]*

Roll No. : .....

**SUSHANT UNIVERSITY**  
**SCHOOL OF ENGINEERING AND TECHNOLOGY**  
**MID TERM EXAMINATION, OCTOBER 2024**  
**23BTC-0MA11T: Engineering Mathematics I**

**Program:** B.Tech

**Semester:** I

**Time:** 1½ Hr.

**Max Mark:** 30

**Instructions:**

1. Section A: Attempt all questions. Each question carries 4 marks.
2. Section B: Attempt any two (2) of three (3) questions. Each question carries 7 marks.

Upon successful completion of the course, the students should be able to:

- CO1: Describe matrix algebra to solving engineering problems. Determine the eigenvalues and eigenvectors of a matrix
- CO2: Distinguish between the concepts of sequence and series. Determine convergence and divergence of series. Understand De Moivre's theorem and find the roots of complex numbers. Application of complex numbers for solving engineering problems
- CO3: Understand application of Leibniz's theorem & Taylor's theorem in real life problems. Demonstrate Knowledge of maxima and minima of function of two variables, Understand Homogeneous Function, asymptotes and curve tracing.

**SECTION A**

**Question 1 (CO 1)**

Use Gauss Jordan method to find the inverse of matrix  $A = \begin{bmatrix} 1 & 3 & 3 & 1 & 4 & 3 & 1 & 3 & 4 \end{bmatrix}$ .

**Question 2 (CO 1)**

Define Rank of a matrix. Find the rank of the matrix  $A = \begin{bmatrix} 3 & -1 & 2 & -6 & 2 & 4 & -3 & 1 & 2 \end{bmatrix}$  by reducing it to normal form.

**Question 3 (CO 2)**

Test the convergence of the series  $\frac{2^n}{n^3}$ .

**Question 4 (CO 1)**

Find eigen values and eigen vectors of the matrix  $A = \begin{bmatrix} 1 & 1 & 3 & 1 & 5 & 1 & 3 & 1 & 1 \end{bmatrix}$ .



**SECTION B**

*Mamunda*

**Question 5 (CO 1)**

Solve the system of equations by matrix method:

$$x + y + z = 3, \quad x + 2y + 3z = 4, \quad x + 4y + 9z = 6.$$

**Question 6 (CO 2)**

Define convergence and divergence of the series Also test the convergence of the following series

$$\sum \left( \sqrt{n^4 + 1} - \sqrt{n^4 - 1} \right).$$

**Question 7 (CO 1)**

Find the characteristic equation of the matrix  $A = \begin{bmatrix} 2 & -1 & 1 & -1 & 2 & -1 & 1 & -2 & 2 \end{bmatrix}$  & hence find  $A^{-1}$  by Cayley-Hamilton theorem. Find the value of  $A^6 - 6A^5 + 9A^4 - 2A^3 - 12A^2 + 23A - 9I$ .

*Mamun*



**SUSHANT UNIVERSITY, GURUGRAM**  
**END TERM EXAMINATION, JANUARY 2022**  
**15BTC-1MA11T: Engineering Mathematics I**

**Program:-B.Tech**

**Time: 2 Hrs.**

**Semester:-I**

**Max Marks: 60**

**Instructions:**

1. Section A: Attempt any four (4) of five (5) question. Each question carries 7 marks
2. Section B: Attempt any two (2) of three (3) questions. Each question carries 10 marks.
3. Section C: Question is compulsory and carries 12 marks.

CO1: Describe matrix algebra to solving engineering problems. Determine the eigenvalues and eigenvectors of a matrix

CO2: Distinguish between the concepts of sequence and series. Determine convergence and divergence of series. Understand De Moivre's theorem and find the roots of complex numbers. Application of complex numbers for solving engineering problems.

CO3: Understand application of Leibniz's theorem & Taylor's theorem in real life problems. Demonstrate knowledge of maxima and minima of function of two variables, Understand homogeneous Function. asymptotes and curve fitting.

**SECTION A**

**Question 1** (CO 1) (K2)

Find the inverse of the matrix  $A = \begin{bmatrix} 1 & 0 & 4 \\ 2 & -2 & 1 \\ -1 & 1 & -1 \end{bmatrix}$  by Gauss-Jordan method.

**Question 2** (CO 2) (K 3)

Discuss the convergence of the series:  $\frac{1}{2} + \frac{1.3}{2.4} + \frac{1.3.5}{2.4.6} + \dots$

**Question 3** (CO 2) (K 5)

If  $\alpha$  &  $\beta$  be the roots of  $x^2 - 2x + 4 = 0$ , prove that  $\alpha^n + \beta^n = 2^{n+1} \cos \frac{n\pi}{3}$ .

**Question 4** (CO 3) (K 4)

If  $y = \sin\{m \sin^{-1} x\}$ , prove that  $(1 - x^2)y_{n+2} - (2n + 1)xy_{n+1} + (m^2 - n^2)y_n = 0$ .

**Question 5** (CO 2) (K 5)

Define normal and Echelon form of matrix. Also find the rank of a matrix

*Mam*

$$A = \begin{bmatrix} 8 & 1 & 3 & 6 \\ 0 & 3 & 2 & 2 \\ -8 & -1 & -3 & 4 \end{bmatrix} \text{ reducing it to normal form.}$$

## SECTION B

### Question 6 (CO 2) (K 3)

Using matrix method, show that the equations  $3x + 3y + 2z = 1$ ,  $x + 2y = 4$ ,  $10y + 3z = -2$ ,  $2x - 3y - z = 5$  are consistent and hence obtain the solutions for  $x, y$ , &  $z$ .

### Question 7 (CO 3) (K 4)

- Test the convergence of the series :  $\sum \left( \frac{n}{n+1} \right)^{n^2}$ .
- Test the convergence of the following series:-  
 $\left( \frac{2^2}{1^2} - \frac{2}{1} \right)^{-1} + \left( \frac{3^3}{2^3} - \frac{3}{2} \right)^{-2} + \left( \frac{4^4}{3^4} - \frac{4}{3} \right)^{-3} + \dots$

### Question 8 (CO 1) (K 2)

- If  $t^{i\infty} = A + iB$  prove that  $\tan \frac{\pi A}{2} = \frac{B}{A}$  &  $A^2 + B^2 = e^{-\pi B}$ .
- If  $u = \frac{y}{z} + \frac{z}{x} + \frac{x}{y}$  prove that  $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} + z \frac{\partial u}{\partial z} = 0$ .

## SECTION C

### Question 9 (CO 3 & CO 1) (K 5)

- Define absolute & conditional convergence of an infinite series. Test the following Series for absolute convergence:

$$1 - \frac{1}{2^3}(1+2) + \frac{1}{3^3}(1+2+3) - \frac{1}{4^3}(1+2+3+4) + \dots$$

- If  $u = \log \frac{x^4 + y^4}{x+y}$ , show that  $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} = 3$ .

*Manuale*



**SESHANT UNIVERSITY**  
**School of Engineering and Technology**  
**Mid Term I Examination, October 2024**

Roll No. D 4114

Candidates & Guard List

Program: B.Tech  
 Course: I  
 Exam Name  
 Max Mark

Roll No.  
 Name  
 Marks  
 Marks

| R.No. | Application No. | Student Name  | Signature          | Marks Obtained | Marks Obtained (In Words) |
|-------|-----------------|---------------|--------------------|----------------|---------------------------|
| 1     | 2400001         | ADITHYAN MATH | <i>[Signature]</i> | 12             | Twelve                    |
| 2     | 2400002         | ADITHYAN MATH | <i>[Signature]</i> | 10             | Ten                       |
| 3     | 2400003         | ADITHYAN MATH | <i>[Signature]</i> | 1              | One                       |
| 4     | 2400004         | ADITHYAN MATH | <i>[Signature]</i> | 18             | Eighteen                  |
| 5     | 2400005         | ADITHYAN MATH | <i>[Signature]</i> | 04             | Four                      |
| 6     | 2400006         | ADITHYAN MATH | <i>[Signature]</i> | 12             | Twelve                    |
| 7     | 2400007         | ADITHYAN MATH | <i>[Signature]</i> | 1              | One                       |
| 8     | 2400008         | ADITHYAN MATH | <i>[Signature]</i> | 24             | Twenty Four               |
| 9     | 2400009         | ADITHYAN MATH | <i>[Signature]</i> | 1              | One                       |
| 10    | 2400010         | ADITHYAN MATH | <i>[Signature]</i> | 19             | Nineteen                  |
| 11    | 2400011         | ADITHYAN MATH | <i>[Signature]</i> | 17             | Seventeen                 |
| 12    | 2400012         | ADITHYAN MATH | <i>[Signature]</i> | 27             | Twenty Seven              |
| 13    | 2400013         | ADITHYAN MATH | <i>[Signature]</i> | 05             | Five                      |
| 14    | 2400014         | ADITHYAN MATH | <i>[Signature]</i> | 26             | Twenty Six                |
| 15    | 2400015         | ADITHYAN MATH | <i>[Signature]</i> | 13             | Thirteen                  |
| 16    | 2400016         | ADITHYAN MATH | <i>[Signature]</i> | 23             | Twenty three              |
| 17    | 2400017         | ADITHYAN MATH | <i>[Signature]</i> | 19             | Nineteen                  |
| 18    | 2400018         | ADITHYAN MATH | <i>[Signature]</i> | 22             | Twenty two                |
| 19    | 2400019         | ADITHYAN MATH | <i>[Signature]</i> | 16             | Sixteen                   |
| 20    | 2400020         | ADITHYAN MATH | <i>[Signature]</i> | 06             | Six                       |
| 21    | 2400021         | ADITHYAN MATH | <i>[Signature]</i> | 12             | Twelve                    |
| 22    | 2400022         | ADITHYAN MATH | <i>[Signature]</i> | 12             | Twelve                    |
| 23    | 2400023         | ADITHYAN MATH | <i>[Signature]</i> | 23             | Twenty three              |
| 24    | 2400024         | ADITHYAN MATH | <i>[Signature]</i> | 21             | Twenty one                |
| 25    | 2400025         | ADITHYAN MATH | <i>[Signature]</i> | 10             | Ten                       |
| 26    | 2400026         | ADITHYAN MATH | <i>[Signature]</i> | 26             | Twenty Six                |
| 27    | 2400027         | ADITHYAN MATH | <i>[Signature]</i> | 07             | Seven                     |
| 28    | 2400028         | ADITHYAN MATH | <i>[Signature]</i> | 00             | Zero                      |
| 29    | 2400029         | ADITHYAN MATH | <i>[Signature]</i> | 06             | Six                       |
| 30    | 2400030         | ADITHYAN MATH | <i>[Signature]</i> | 11             | Eleven                    |

Total number of students: 32

Student Present: 27

Absent: 05

1. Invigilator's Name and Signature: *[Signature]*

Examiner's Signature: *[Signature]*

2. Invigilator's Name and Signature: *[Signature]*

Examiner's Name: *[Signature]*



**SUSHANT UNIVERSITY**  
**School of Engineering and Technology**  
**Mid Term Examination, October 2024**  
**Room No.: D-322**

**Attendance & Award List**

Program & Tech (Sec 1)  
 Control Code  
 Faculty Name  
 Max Marks

Semester: I  
 Course Title:  
 Exam Date:  
 Weightage:

| R No. | Application No. | Student Name             | Signature          | Marks Obtained | Marks Obtained (In Words) |
|-------|-----------------|--------------------------|--------------------|----------------|---------------------------|
| 1     | 2400578         | KRISHNA GEMINI           | <i>[Signature]</i> | 19             | Nineteen                  |
| 2     | 2400555         | HARSHIT                  | <i>[Signature]</i> | 29             | Twenty nine               |
| 3     | 2400559         | HARSH SHARMA             | <i>[Signature]</i> | 11             | Eleven                    |
| 4     | 2401164         | POORAV YADAV             | <i>[Signature]</i> | 13             | Thirteen                  |
| 5     | 2400600         | KYATHIKA RAO SEELAM      | <i>[Signature]</i> | 29             | Twenty nine               |
| 6     | 2400720         | HIMANSHU KUMAR CHAUDHARY | <i>[Signature]</i> | 19             | Nineteen                  |
| 7     | 2400733         | MAYANK SHARMA            | <i>[Signature]</i> | 23             | Twenty three              |
| 8     | 2400794         | KANISHK GAUR             | <i>[Signature]</i> | 20             | Twenty                    |
| 9     | 2400827         | KUNAL JOON               | <i>[Signature]</i> | 25             | Twenty five               |
| 10    | 2400952         | KANISHKA                 | <i>[Signature]</i> | 20             | Twenty                    |
| 11    | 2400972         | HARSHIT CHHILLAR         | <i>[Signature]</i> | 14             | Fourteen                  |
| 12    | 2400993         | MAYANK KAUSHIK           | <i>[Signature]</i> | 23             | Twenty three              |
| 13    | 2401097         | KAUSHAL YADAV            | <i>[Signature]</i> | 21             | Twenty one                |
| 14    | 2401151         | FAIZAN KHAN              | <i>[Signature]</i> | 11             | Eleven                    |
| 15    | 2401283         | MANI SHANKAR JHA         | <i>[Signature]</i> | 02             | Two                       |
| 16    | 2401299         | MAYANK RATHORE           | <i>[Signature]</i> | 02             | Two                       |
| 17    | 2401579         | KRISHNA JANGID           | <i>[Signature]</i> | 02             | Two                       |
| 18    | 2401604         | KUSHAGRA                 | <i>[Signature]</i> | 02             | Two                       |
| 19    | 2401728         | KRRISH SHARMA            | <i>[Signature]</i> | 02             | Two                       |
| 20    | 2401782         | KUMAR ANKIT              | <i>[Signature]</i> | 02             | Two                       |
| 21    | 2401820         | KANISHKA SRIVASTAVA      | <i>[Signature]</i> | 02             | Two                       |
| 22    | 2401939         | SARTHAK PANDAY           | <i>[Signature]</i> | 02             | Two                       |
| 23    | 2401995         | AKSHIT MATHUR            | <i>[Signature]</i> | 02             | Two                       |
| 24    | 2402062         | SANJEEV KUMAR            | <i>[Signature]</i> | 02             | Two                       |
| 25    | 2402112         | Shiv Kumar Ray           | <i>[Signature]</i> | 02             | Two                       |
| 26    | 2402253         | Vipin Singh Yadav        | <i>[Signature]</i> | 02             | Two                       |
| 27    | 2402188         | PRAGYA                   | <i>[Signature]</i> | 02             | Two                       |

Total number of students: 27  
 Student Present: 23 Absent: 04

1. Invigilator's Name and Signature: *[Signature]*  
 2. Invigilator's Name and Signature: *[Signature]*

Examiner's Signature: *[Signature]*  
 Examiner's Name: \_\_\_\_\_

*[Signature]*



**SESHANT UNIVERSITY**  
School of Engineering and Technology  
Mid Term Examination, October 2024

Room No.: D 305  
Attendance & Award List

Page No. : \_\_\_\_\_  
Page No. : \_\_\_\_\_  
Page No. : \_\_\_\_\_

Signature : \_\_\_\_\_  
Examiner : \_\_\_\_\_  
Examiner : \_\_\_\_\_  
Examiner : \_\_\_\_\_

Examiner : Mathematics

| S.No. | Application No. | Student Name                         | Signature | Marks (Obtained) | Marks (Obtained (In Words)) |
|-------|-----------------|--------------------------------------|-----------|------------------|-----------------------------|
| 1     | 2401358         | TAKSHI ROOP                          |           |                  |                             |
| 2     | 2401358         | DIVYANSH YADAV                       |           | 18               | Eighteen                    |
| 3     | 2401358         | YASH KUMAR                           |           | 06               | Six                         |
| 4     | 2401358         | YASH                                 |           | 21               | Twenty one                  |
| 5     | 2401358         | YASH                                 |           | 17               | Seventeen                   |
| 6     | 2401358         | TANIYA MALIK                         |           | ABSENT           |                             |
| 7     | 2401363         | SRITARA                              |           | 25               | Twenty five                 |
| 8     | 2401441         | YASH YADAV                           |           | 25               | Twenty five                 |
| 9     | 2401443         | SHUBHAM TANWAR                       |           | 20               | Twenty                      |
| 10    | 2401516         | VARSHA                               |           | 17               | Seventeen                   |
| 11    | 2401640         | SARTHAK MEHTA                        |           | 22               | Twenty two                  |
| 12    | 2401804         | SANA GHOSH                           |           | ABSENT           |                             |
| 13    | 2401872         | TANISHKA GUPTA                       |           | 08               | Eight                       |
| 14    | 2401927         | SUHAN                                |           | 21               | Twenty one                  |
| 15    | 2401992         | AVNISH                               |           | 26               | Twenty six                  |
| 16    | 2402003         | DEEKSHA SORAJ                        |           | 02               | Two                         |
| 17    | 2402024         | ASHANK SHARMA                        |           | 12               | Twelve                      |
| 18    | 2402026         | LAKSHITA                             |           | 14               | Fourteen                    |
| 19    | 2402027         | MOHAMED KHLID MOHAMED AHMED          |           | 18               | Eighteen                    |
| 20    | 2401175         | MOHAMOUD ALLAAELDEEN ALI ABDEL FATAH |           | 07               | Seven                       |
| 21    | 2401971         | NEERAJ RANA                          |           | 02               | Two                         |
| 22    | 2402017         | AARYAVEER SINGH RANA                 |           | 10               | Ten                         |
| 23    | 2402070         | MANAN KOCHAR                         |           | ABSENT           |                             |
| 24    | 2402073         | DIVYANSH Kaushik                     |           | 25               | Twenty five                 |
| 25    | 2402093         | SAMEER PAHWA                         |           | 06               | Six                         |
| 26    | 2402093         | Satvik Upadhyay                      |           | 08               | Eight                       |
|       |                 |                                      |           | 12               | Twelve                      |

Total number of students: 26  
Student Present: 23 Absent: 03

1. Invigilator's Name and Signature: Umesh Kumar

2. Invigilator's Name and Signature: Umesh Kumar

Examiner's Signature: \_\_\_\_\_

Examiner's Name: \_\_\_\_\_

Manoj



**SI SHANT UNIVERSITY**  
**School of Engineering and Technology**  
**Mid Term Examination, October 2024**  
**Room No.: D-320**

**Attendance & Award List**

Program & Tech (Part B):  
 Course Code: **SAI**  
 Examinator Name:  
 Vice-Chancellor

Computer: 1  
 Course Title:  
 Exam Date:  
 Weightage:

| S.No. | Application No. | Student Name     | Signature               | Marks Obtained | Marks Obtained (In Words) |
|-------|-----------------|------------------|-------------------------|----------------|---------------------------|
| 1     | 2400374         | SAMEER VATS      | <i>Sameer Vats</i>      | 26             | Twenty Six                |
| 2     | 2400400         | MONIS NISHAT     | <i>Monis Nishat</i>     | 26             | Twenty Six                |
| 3     | 2400432         | NITIN            | <i>Nitin</i>            | 27             | Twenty Seven              |
| 4     | 2400510         | SAARA TEWATHIA   | <i>Saara Tewathia</i>   | 26             | Twenty Six                |
| 5     | 2400569         | PALAK SHRIVASTAV | <i>Palak Shrivastav</i> | 27             | Twenty Seven              |
| 6     | 2400673         | NIKHIL PATEL     | <i>Nikhil Patel</i>     | 27             | Twenty Seven              |
| 7     | 2400726         | RAJ ARYAN        | <i>Raj Aryan</i>        | 27             | Twenty Seven              |
| 8     | 2400866         | PRINCE           | <i>Prince</i>           | 27             | Twenty Seven              |
| 9     | 2400966         | PRINCE BHARDWAJ  | <i>Prince Bhardwaj</i>  | 22             | Twenty Two                |
| 10    | 2401101         | NARESH KUMAR     | <i>Naresh Kumar</i>     | 09             | Nine                      |
| 11    | 2401119         | NINHAL           | <i>Ninhal</i>           | 15             | Fifteen                   |
| 12    | 2401216         | MOHD HAMZA       | <i>Mohd Hamza</i>       | 15             | Fifteen                   |
| 13    | 2401304         | RITESH KUMAR     | <i>Ritesh Kumar</i>     | 15             | Fifteen                   |
| 14    | 2401350         | RUPESH           | <i>Rupesh</i>           | 08             | Eight                     |
| 15    | 2401422         | PREET YADAV      | <i>Preet Yadav</i>      | 08             | Eight                     |
| 16    | 2401437         | PARINEETA        | <i>Parineeta</i>        | 08             | Eight                     |
| 17    | 2401458         | NAITIK PRATEEK   | <i>Naitik Prateek</i>   | 08             | Eight                     |
| 18    | 2401493         | RISHI            | <i>Rishi</i>            | 04             | Four                      |
| 19    | 2401526         | PIYUSH CHOUBEY   | <i>Piyush Choubey</i>   | 19             | Nineteen                  |
| 20    | 2401586         | MOHIT            | <i>Mohit</i>            | 04             | Four                      |
| 21    | 2401692         | RITESH MAAN      | <i>Ritesh Maan</i>      | 21             | Twenty One                |
| 22    | 2401812         | PRASHANT SHARMA  | <i>Prashant Sharma</i>  | 19             | Nineteen                  |
| 23    | 2402006         | DIVYANSHU RANA   | <i>Divyanshu Rana</i>   | 18             | Eighteen                  |
| 24    | 2401833         | PUSHKAR SHARMA   | <i>Pushkar Sharma</i>   | 18             | Eighteen                  |
| 25    | 2401921         | PREET BHADANA    | <i>Preet Bhadana</i>    | 07             | Seven                     |
| 26    | 2402256         | Payal Yadav      | <i>Payal Yadav</i>      | 07             | Seven                     |
| 27    | 2401102         | AADITYA JHA      | <i>Aaditya Jha</i>      | 01             | One                       |
| 28    | 2400599         | JAI KUMAR JHA    | <i>Jai Kumar Jha</i>    | 01             | One                       |
| 29    | 2402277         | Yash Raj Kaushik | <i>Yash Raj Kaushik</i> | 01             | One                       |
| 30    | 2400214         | SOHAM VERMA      | <i>Soham Verma</i>      | 16             | Sixteen                   |
| 31    | 2400372         | UNNATI           | <i>Unnati</i>           | 16             | Sixteen                   |

Total number of students: 31  
 Student Present: 18 Absent: 13

1. Invigilator's Name and Signature: *P. Kumar*

Examiner's Signature: \_\_\_\_\_

2. Invigilator's Name and Signature: *Prateek Kumar*

Examiner's Name: \_\_\_\_\_

*Manish*



**SUSHANT UNIVERSITY**  
**School of Engineering and Technology**  
**Mid Term Examination, October 2024**

**Room No.: D-301**

**Attendance & Award List**

Program : B.Tech (Sec-B)

Course Code:

Faculty Name:

Max. Marks:

Semester : I

Course Title:

Exam Date :

Weightage:

| S.No. | Application No. | Student Name   | Signature          | Marks Obtained | Marks Obtained (In Words) |
|-------|-----------------|----------------|--------------------|----------------|---------------------------|
| 1     | 2401457         | AARYAN KASHYAP | <i>[Signature]</i> | 07             | Seven                     |
| 2     | 2402074         | Kumar Arjan    | <i>[Signature]</i> | 09             | Nine                      |
|       |                 |                |                    |                |                           |
|       |                 |                |                    |                |                           |
|       |                 |                |                    |                |                           |
|       |                 |                |                    |                |                           |
|       |                 |                |                    |                |                           |
|       |                 |                |                    |                |                           |
|       |                 |                |                    |                |                           |

Total number of students: 02

Student Present: 02 Absent: Nil

1. Invigilator's Name and Signature: *[Signature]* 24/10/24

2. Invigilator's Name and Signature: *[Signature]*

Examiner's Signature: \_\_\_\_\_

Examiner's Name : \_\_\_\_\_

*[Handwritten Signature]*



**SUSILANT UNIVERSITY**  
**School of Engineering and Technology**  
**Mid Term Examination, October 2024**  
**Room No.: D-322**

Program : B.Tech (Sec-B)  
Course Code:  
Faculty Name:  
Max. Marks:

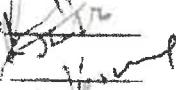
**Attendance & Award List**

Semester : I  
Course Title:  
Exam Date :  
Weightage:

| S.No. | Application No. | Student Name    | Signature                                                                          | Marks Obtained | Marks Obtained (In Words) |
|-------|-----------------|-----------------|------------------------------------------------------------------------------------|----------------|---------------------------|
| 1     | 2400447         | ROSSANE HENRICK |  | 10             | Ten                       |
|       |                 |                 |                                                                                    |                |                           |
|       |                 |                 |                                                                                    |                |                           |
|       |                 |                 |                                                                                    |                |                           |
|       |                 |                 |                                                                                    |                |                           |
|       |                 |                 |                                                                                    |                |                           |

Total number of students: 01

Student Present: 10 Absent: 01

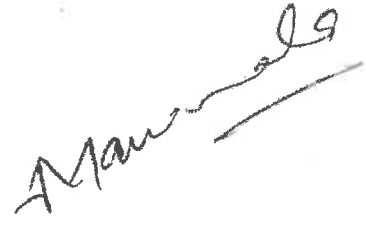
1. Invigilator's Name and Signature: 

Examiner's Signature: \_\_\_\_\_

2. Invigilator's Name and Signature: 

Examiner's Name : \_\_\_\_\_

  
24.10.24





### Attendance & Award List

**& Award List**

|               |               |
|---------------|---------------|
| Room No.      | D 305         |
| Semester : 1  |               |
| Course Title: | Mathematics I |
| Exam Date :   | 25/11/24      |
| Weightage:    |               |

Total number of students: 6  
Student Present: 06 'Absent: 00

1. Invigilator's Name and Signature: \_\_\_\_\_

2. Invigilator's Name and Signature : \_\_\_\_\_

Examiner's Signature: M. J. [Signature]

Examiner's Name : \_\_\_\_\_

Manusals



ANNEXURE-II

**School of Engineering & Technology, Sushant University**

Course Title: Mathematics I

Semester: I

Course Code: 23BTC-OMA11T

Course Faculty: Dr. Manimala

Programme: B.Tech

Sir/Madam,

Following students mentioned in the list are identified as Slow learner/ learner based on guidelines issued by IQAC after second assessment (declaration of Mid-term marks).

| S No | Roll No      | Student Name     |
|------|--------------|------------------|
| 1    | 240BTCCSE033 | AARYAN KASHYAP   |
| 2    | 240BTCCSE081 | ANKIT NAGAR      |
| 3    | 240BTCCSE054 | AVNISH           |
| 4    | 240BTCCSE038 | BHAVIK CHAWLA    |
| 5    | 240BTCCSE066 | DIVYANSH Kaushik |
| 6    | 240BTCCSE106 | Dishant          |
| 7    | 240BTCCSE044 | FAIZAN KHAN      |
| 8    | 240BTCCSE036 | JAI KUMAR JHA    |
| 9    | 240BTCCSE017 | JAYANT GAUR      |
| 10   | 240BTCCSE117 | KUMAR ANKIT      |
| 11   | 240BTCCSE055 | Kumar Aryan      |
| 12   | 240BTCCSE051 | MAYANK Rathor    |
| 13   | 240BTCCSE014 | MOHIT            |
| 14   | 240BTCCSE025 | NARESH KUMAR     |
| 15   | 240BTCCSE118 | Neeraj Rana      |
| 16   | 240BTCCSE136 | Payal Yadav      |
| 17   | 240BTCCSE071 | Pragya           |
| 18   | 240BTCCSE107 | Rahul Sehrawat   |
| 19   | 240BTCCSE121 | RISHI            |
| 20   | 240BTCCSE088 | RUPESH           |
| 21   | 240BTCCSE086 | Sameer Pahwa     |
| 22   | 240BTCCSE058 | SANA GHOSH       |
| 23   | 240BTCCSE058 | Sarthak Panday   |
| 24   | 240BTCCSE083 | Vipin            |
| 25   | 240BTCCSE011 | YUVANSH          |

*Manimala*



*Mamunalo*

Signature of Course Coordinator/Faculty

*JS*

Programme Coordinator

*[Signature]*

**Sushant**  
University

Dean

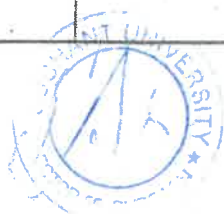


Timetable w.e.f. 06/November, 2024

# Teacher Dr. Marimela

Ansal University, Sector 55, Golf Course Road, Gurgaon, Haryana - 122003

|    | 9:10 - 10:00<br>1                                                      | 10:05 - 10:55<br>2                                                     | 11:00 - 11:50<br>3                                            | 11:55 - 12:45<br>4                                                     | 12:45 - 13:25<br>5 | 13:25 - 14:15<br>6                                                   | 14:20 - 15:10<br>7                                              | 15:15 - 16:05<br>8 | 16:10 - 17:00<br>9 |
|----|------------------------------------------------------------------------|------------------------------------------------------------------------|---------------------------------------------------------------|------------------------------------------------------------------------|--------------------|----------------------------------------------------------------------|-----------------------------------------------------------------|--------------------|--------------------|
| Mo | Mathematics-I<br>B.Tech CSE -<br>Section B (1st Sem)<br>D-322          | Discrete<br>Mathematics<br>B.Tech CSE - AI/<br>ML (IInd Sem)<br>D-413A |                                                               | Discrete<br>Mathematics<br>B.Tech CSE -<br>Cyber (IInd Sem)<br>D-305   |                    | Mathematics-I<br>B.Tech CSE -<br>Section A (1st Sem)<br>D-413A       |                                                                 |                    |                    |
|    | Mathematics-I                                                          | Mathematics-I                                                          |                                                               | Discrete<br>Mathematics<br>B.Tech CSE - AI/<br>ML (IInd Sem)<br>D-413A |                    | Discrete<br>Mathematics<br>B.Tech CSE -<br>Cyber (IInd Sem)<br>D-311 |                                                                 |                    |                    |
|    | B.Tech CSE -<br>Section B (1st Sem)<br>D-305                           | B.Tech CSE -<br>Section A (1st Sem)<br>D-301                           |                                                               |                                                                        |                    | B.Tech CSE -<br>Section A (1st Sem)<br>D-301                         | B.Tech CSE -<br>Section A (1st Sem)<br>D-301                    |                    |                    |
| Tu | Mathematics-I                                                          | Discrete<br>Mathematics<br>B.Tech CSE - AI/<br>ML (IInd Sem)<br>D-413A |                                                               | Discrete<br>Mathematics<br>B.Tech CSE -<br>Cyber (IInd Sem)<br>D-301   |                    | Mathematics-I<br>B.Tech CSE -<br>Section A (1st Sem)<br>D-301        | Remedial Class<br>B.Tech CSE -<br>Section B (1st Sem)<br>D-312C |                    |                    |
|    | B.Tech CSE -<br>Section B (1st Sem)<br>D-305                           | B.Tech CSE -<br>Section A (1st Sem)<br>D-301                           |                                                               |                                                                        |                    | B.Tech CSE -<br>Section A (1st Sem)<br>D-301                         | B.Tech CSE -<br>Section A (1st Sem)<br>D-301                    |                    |                    |
|    | Mathematics-I                                                          | Discrete<br>Mathematics<br>B.Tech CSE - AI/<br>ML (IInd Sem)<br>D-413A |                                                               | Discrete<br>Mathematics<br>B.Tech CSE -<br>Cyber (IInd Sem)<br>D-301   |                    | Mathematics-I<br>B.Tech CSE -<br>Section A (1st Sem)<br>D-301        | Remedial Class<br>B.Tech CSE -<br>Section B (1st Sem)<br>D-312C |                    |                    |
| We | Mathematics-I                                                          | Discrete<br>Mathematics<br>B.Tech CSE - AI/<br>ML (IInd Sem)<br>D-413A |                                                               | Discrete<br>Mathematics<br>B.Tech CSE -<br>Cyber (IInd Sem)<br>D-301   |                    | Mathematics-I<br>B.Tech CSE -<br>Section A (1st Sem)<br>D-301        | Remedial Class<br>B.Tech CSE -<br>Section B (1st Sem)<br>D-312C |                    |                    |
|    | B.Tech CSE -<br>Section B (1st Sem)<br>D-305                           | B.Tech CSE -<br>Section A (1st Sem)<br>D-301                           |                                                               |                                                                        |                    | B.Tech CSE -<br>Section A (1st Sem)<br>D-301                         | B.Tech CSE -<br>Section A (1st Sem)<br>D-301                    |                    |                    |
|    | Mathematics-I                                                          | Discrete<br>Mathematics<br>B.Tech CSE - AI/<br>ML (IInd Sem)<br>D-413A |                                                               | Discrete<br>Mathematics<br>B.Tech CSE -<br>Cyber (IInd Sem)<br>D-301   |                    | Mathematics-I<br>B.Tech CSE -<br>Section A (1st Sem)<br>D-301        | Remedial Class<br>B.Tech CSE -<br>Section B (1st Sem)<br>D-312C |                    |                    |
| Th | Discrete<br>Mathematics<br>B.Tech CSE - AI/<br>ML (IInd Sem)<br>D-413A | Mathematics-I<br>B.Tech CSE -<br>Section B (1st Sem)<br>D-322          |                                                               | Discrete<br>Mathematics<br>B.Tech CSE -<br>Cyber (IInd Sem)<br>D-311   |                    | Mathematics-I<br>B.Tech CSE -<br>Section A (1st Sem)<br>D-301        |                                                                 |                    |                    |
|    | B.Tech CSE -<br>Section B (1st Sem)<br>D-413A                          | B.Tech CSE -<br>Section A (1st Sem)<br>D-322                           |                                                               |                                                                        |                    | B.Tech CSE -<br>Section A (1st Sem)<br>D-301                         |                                                                 |                    |                    |
|    | Mathematics-I                                                          | Mathematics-I                                                          |                                                               | Discrete<br>Mathematics<br>B.Tech CSE -<br>Cyber (IInd Sem)<br>D-311   |                    | Mathematics-I<br>B.Tech CSE -<br>Section A (1st Sem)<br>D-301        |                                                                 |                    |                    |
| Fr |                                                                        |                                                                        | Mathematics-I<br>B.Tech CSE -<br>Section A (1st Sem)<br>D-301 |                                                                        |                    | Mathematics-I<br>B.Tech CSE -<br>Section B (1st Sem)<br>D-322        |                                                                 |                    |                    |
|    |                                                                        |                                                                        | B.Tech CSE -<br>Section A (1st Sem)<br>D-301                  |                                                                        |                    | B.Tech CSE -<br>Section B (1st Sem)<br>D-322                         |                                                                 |                    |                    |
|    |                                                                        |                                                                        | Mathematics-I<br>B.Tech CSE -<br>Section A (1st Sem)<br>D-301 |                                                                        |                    | Mathematics-I<br>B.Tech CSE -<br>Section B (1st Sem)<br>D-322        |                                                                 |                    |                    |



**SCHOOL OF ENGINEERING & TECHNOLOGY, SUSHANT UNIVERSITY**  
**ATTENDANCE SHEET - Slow Learners**  
**REMEDIAL CLASSES SCHEDULE CUM ATTENDANCE SHEET FOR SLOW LEARNERS**

Program/Batch: B.Tech  
 Course Code: 23BTC-OMA11T  
 Course Title: Mathematics I

Semester: I  
 Faculty Na: Dr. Manimala  
 Date:

| S.no | Enrollment No. | Student name     | Date: 11/11/25 | Time: 2:10-3:10 | Signature | Date: 11/11/25 | Time: 3:10-4:10 | Signature | Date: 11/11/25 | Time: 4:10-5:10 | Signature | Remarks (Outcome) |
|------|----------------|------------------|----------------|-----------------|-----------|----------------|-----------------|-----------|----------------|-----------------|-----------|-------------------|
| 1    | 240BTCCSE033   | AARYAN KASHYAP   |                |                 |           |                |                 |           |                |                 |           |                   |
| 2    | 240BTCCSE081   | ANKIT NAGAR      |                |                 |           |                |                 |           |                |                 |           |                   |
| 3    | 240BTCCSE054   | AVNISH           |                |                 |           |                |                 |           |                |                 |           |                   |
| 4    | 240BTCCSE038   | BHAVIK CHAWLA    |                |                 |           |                |                 |           |                |                 |           |                   |
| 5    | 240BTCCSE066   | DIVYANSH Kaushik |                |                 |           |                |                 |           |                |                 |           |                   |
| 6    | 240BTCCSE106   | Dishant          |                |                 |           |                |                 |           |                |                 |           |                   |
| 7    | 240BTCCSE044   | FAIZAN KHAN      |                |                 |           |                |                 |           |                |                 |           |                   |
| 8    | 240BTCCSE036   | JAI KUMAR JHA    |                |                 |           |                |                 |           |                |                 |           |                   |
| 9    | 240BTCCSE017   | JAYANT GAUR      |                |                 |           |                |                 |           |                |                 |           |                   |
| 10   | 240BTCCSE117   | KUMAR ANKIT      |                |                 |           |                |                 |           |                |                 |           |                   |
| 11   | 240BTCCSE055   | Kumar Aryan      |                |                 |           |                |                 |           |                |                 |           |                   |
| 12   | 240BTCCSE051   | MAYANK Rathor    |                |                 |           |                |                 |           |                |                 |           |                   |
| 13   | 240BTCCSE014   | MOHIT            |                |                 |           |                |                 |           |                |                 |           |                   |
| 14   | 240BTCCSE025   | NARESH KUMAR     |                |                 |           |                |                 |           |                |                 |           |                   |
| 15   | 240BTCCSE118   | Neeraj Rana      |                |                 |           |                |                 |           |                |                 |           |                   |
| 16   | 240BTCCSE136   | Payal Yadav      |                |                 |           |                |                 |           |                |                 |           |                   |
| 17   | 240BTCCSE071   | Pragya           |                |                 |           |                |                 |           |                |                 |           |                   |
| 18   | 240BTCCSE107   | Rahul Sehrawat   |                |                 |           |                |                 |           |                |                 |           |                   |
| 19   | 240BTCCSE121   | RISHI            |                |                 |           |                |                 |           |                |                 |           |                   |
| 20   | 240BTCCSE088   | RUPESH           |                |                 |           |                |                 |           |                |                 |           |                   |
| 21   | 240BTCCSE086   | Sameer Pahlwa    |                |                 |           |                |                 |           |                |                 |           |                   |
| 22   | 240BTCCSE058   | SANA GHOSH       |                |                 |           |                |                 |           |                |                 |           |                   |
| 23   | 240BTCCSE058   | Sarthak Panday   |                |                 |           |                |                 |           |                |                 |           |                   |
| 24   | 240BTCCSE083   | Vipin            |                |                 |           |                |                 |           |                |                 |           |                   |
| 25   | 240BTCCSE011   | YUVANSH          |                |                 |           |                |                 |           |                |                 |           |                   |

Faculty Signature:



*Manimala*

Name

Sana Gihosh

Year

2024

Subject

Math

Class

B Tech

Semester

1st

Roll No.

240BTCESE058

## I N D E X

Sr. No.

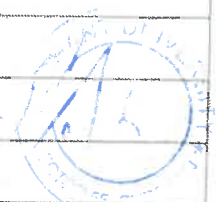
Experiment Description

Experiment Date

Submission Date

Remarks / Signature

Remedial Assignment



# Matrices

## Assignment - 1

1. Reduce - triangular form,  $A = \begin{bmatrix} 3 & -4 & -5 \\ -9 & 1 & 4 \\ -5 & 3 & 1 \end{bmatrix}$

$$A = \begin{bmatrix} 3 & -4 & -5 \\ -9 & 1 & 4 \\ -5 & 3 & 1 \end{bmatrix}$$

$$R_2 \rightarrow 3R_1 + R_2 \quad \text{or} \quad R_2 \rightarrow R_2 + 3R_1$$

$$A \sim \begin{bmatrix} 3 & -4 & -5 \\ 0 & -11 & -11 \\ -5 & 3 & 1 \end{bmatrix}$$

$$R_3 \rightarrow R_3 + 5R_1$$

$$A \sim \begin{bmatrix} 3 & -4 & -5 \\ 0 & -11 & -11 \\ 0 & -14/3 & -22/3 \end{bmatrix}$$

$$R_3 \rightarrow R_3 + (-1/3)R_2$$

$$A \sim \begin{bmatrix} 3 & -4 & -5 \\ 0 & -11 & -11 \\ 0 & 0 & -14/3 \end{bmatrix}$$

2.  $A = \begin{bmatrix} 2 & 3 & -1 \\ 0 & -3 & 2 \\ -5 & 3 & 7 \end{bmatrix}$

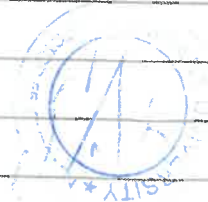
$$R_3 \rightarrow R_3 + \frac{5}{2}R_1$$

$$A \sim \begin{bmatrix} 2 & 3 & -1 \\ 0 & -3 & 2 \\ -5 & 3 & 7 \end{bmatrix}$$

$$R_3 \rightarrow R_3 + 5/2 R_1$$

$$A \rightarrow \begin{bmatrix} 2 & 3 & -1 \\ 0 & -3 & 2 \\ 0 & 21/2 & 9/2 \end{bmatrix}$$

$$\begin{bmatrix} 2 & 3 & -1 \\ 0 & -3 & 2 \\ 0 & 0 & 23/2 \end{bmatrix}$$



$$R_2 \rightarrow R_2 - 2R_1$$

$$\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix} = \begin{bmatrix} 1/3 & -2/3 & -1/3 \\ 1/3 & -5/3 & 2/3 \\ -1 & 4 & 0 \end{bmatrix}$$

proved.

Q3) by using elementary transformation that the inverse of each of the following.

$$6) \begin{bmatrix} 1 & 1 & 3 \\ 1 & 3 & -3 \\ -2 & -4 & 4 \end{bmatrix}$$

$$A = \begin{bmatrix} 1 & 1 & 3 \\ 1 & 3 & -3 \\ -2 & -4 & 4 \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 2 & -6 \\ 0 & 0 & 1 \end{bmatrix} A$$

$$R_2 \rightarrow R_2 - R_1$$

$$\begin{bmatrix} 1 & 1 & 3 \\ 0 & 2 & -6 \\ 0 & -2 & 4 \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 \\ 1 & 1 & 0 \\ 2 & 0 & 1 \end{bmatrix} A$$

$$R_2 \rightarrow (R_2/2)$$

$$\begin{bmatrix} 1 & 1 & 3 \\ 0 & 1 & -3 \\ 0 & 0 & -4 \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 \\ -1/2 & 1/2 & 0 \\ 1 & 1 & 1 \end{bmatrix} A$$

$$R_3 \rightarrow -1/4 R_3$$

$$\begin{bmatrix} 1 & 1 & 3 \\ 0 & 1 & -3 \\ 0 & 0 & 1 \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 \\ 1/2 & 1/2 & 0 \\ -1/4 & -1/4 & 1/4 \end{bmatrix} A$$

$$R_1 \rightarrow R_1 - 3R_3, R_2 \rightarrow R_2 + 3R_3$$

$$\begin{bmatrix} 1 & 1 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix} = \begin{bmatrix} -1/4 & 3/4 & 3/4 \\ -5/4 & -1/4 & -3/4 \\ -1/4 & -1/4 & 1/4 \end{bmatrix} A$$

$$\begin{bmatrix} 3 & 4 & 5 \\ 2 & 6 & 7 \\ 5 & 0 & 10 \end{bmatrix} = 3(60-0) - 4(20-30) + 5(-30) \\ = 70 \neq 0 \\ \rho = 3$$

iv)  $\begin{bmatrix} 2 & -4 & 6 \\ -1 & 2 & -3 \\ 3 & -6 & 9 \end{bmatrix} = 2(18-18) + 4(-9+9) + 6(6-6) \\ = 0 \\ \text{Rank is } 0.$

Q)  $\begin{bmatrix} 3 & -1 & 2 \\ -6 & 2 & 4 \\ -3 & 1 & 2 \end{bmatrix}$

$C_1 \rightarrow \frac{1}{3}C_1, C_3 \rightarrow \frac{1}{2}C_3$

$$\begin{bmatrix} 1 & -1 & 1 \\ -2 & 2 & 2 \\ -1 & 1 & 1 \end{bmatrix}$$

$R_2 \rightarrow \frac{1}{2}R_2$

$$\begin{bmatrix} 1 & -1 & 1 \\ -1 & 1 & 1 \\ -1 & 1 & 1 \end{bmatrix}$$

$R_2 \rightarrow R_1 + R_2$

$$\begin{bmatrix} 1 & -1 & 1 \\ 0 & 0 & 2 \\ -1 & 1 & 1 \end{bmatrix}$$

$R_3 \rightarrow R_3 - R_2$

$$\begin{bmatrix} 1 & -1 & 1 \\ 0 & 0 & 2 \\ 0 & 0 & 2 \end{bmatrix}$$

$C_2 \leftrightarrow C_3$

$$\begin{bmatrix} 1 & 1 & 1 \\ 0 & 0 & 2 \\ 0 & 0 & 0 \end{bmatrix}$$

$C_2 \rightarrow \frac{1}{2}C_2$

$$\begin{bmatrix} 1 & 0 & 0 \\ 0 & 2 & 0 \\ 0 & 0 & 0 \end{bmatrix}$$

$$\begin{bmatrix} 1 & 2 & 0 \\ 0 & 0 & 0 \end{bmatrix}$$

$\rho(A) = 2$



$$\begin{bmatrix} -1 & -1 & -1 & -1 \\ 6 & 7 & 8 & 9 \\ 5 & 5 & 5 & 5 \\ 10 & 10 & 10 & 10 \end{bmatrix}$$

$$\begin{aligned} R_2 &\rightarrow R_2 + 6R_1 \\ R_3 &\rightarrow R_3 + 5R_1 \\ R_4 &\rightarrow R_4 + 10R_1 \\ R_1 &\rightarrow -R_1 \end{aligned}$$

$$\begin{bmatrix} 1 & 1 & 1 & 1 \\ 0 & 1 & 2 & 3 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \end{bmatrix}$$

$$\Rightarrow \rho(A) = 2$$

Q) 7) a)  $\begin{bmatrix} 1 & -4 & -1 & 2 \\ 1 & 7 & 3 & 1 \\ 5 & -2 & 5 & 4 \\ 0 & -3 & 7 & 2 \end{bmatrix}$

$$R_2 \rightarrow R_2 - R_1, R_3 \rightarrow R_3 - 5R_1, R_4 \rightarrow R_4 - 4R_1$$

$$\begin{bmatrix} 1 & -4 & -1 & 2 \\ 0 & 11 & 4 & -1 \\ 0 & 18 & 10 & -6 \\ 0 & 33 & 16 & -4 \end{bmatrix}$$

$$|A| = -112 \neq 0$$

$$\rho(A) = 3$$

b)  $\begin{bmatrix} -1 & 2 & 3 & -2 \\ 2 & -5 & 1 & 2 \\ 3 & -8 & 5 & 2 \\ 5 & -12 & 7 & 6 \end{bmatrix}$

$$R_1 \rightarrow -R_1, R_2 \rightarrow R_2 - 2R_1$$

$$\begin{bmatrix} 1 & -2 & -3 & 2 \\ 0 & -1 & 7 & -2 \\ 0 & -2 & 14 & -4 \\ 0 & -2 & 4 & -4 \end{bmatrix}$$



$$R_1 \rightarrow -R_1, R_2 \rightarrow R_2 - 2R_1$$

$$\begin{bmatrix} 1 & -2 & -3 & 2 \\ 0 & -1 & 7 & -2 \\ 0 & -2 & 14 & -4 \\ 0 & -2 & 4 & -4 \end{bmatrix}$$

$$R_3 \rightarrow -R_3, R_4 \rightarrow R_4 + R_3, R_3 \rightarrow R_3 + 2R_2$$

$$\begin{bmatrix} 1 & -2 & -3 & 2 \\ 0 & -1 & 7 & -2 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \end{bmatrix}$$

$$\rho(A) = 2$$

(c)

$$\begin{bmatrix} 2 & 4 & 3 & -2 \\ -3 & -2 & -1 & -4 \\ 6 & -1 & 7 & 2 \end{bmatrix}$$

$$R_3 \rightarrow R_3 + 2R_2$$

$$\begin{bmatrix} 2 & 4 & 3 & -2 \\ -3 & -2 & -1 & -4 \\ 6 & -1 & 7 & 2 \end{bmatrix}$$

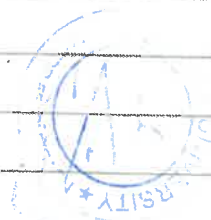
$$\rho(A) = 3$$

d)

$$\begin{bmatrix} 1 & 2 & 3 & 4 \\ 2 & 3 & 4 & 5 \\ 3 & 4 & 5 & 6 \\ 4 & 5 & 6 & 7 \end{bmatrix}$$

$$R_3 \rightarrow R_3 - R_1, R_2 \rightarrow R_2 - R_1$$

$$\begin{bmatrix} 1 & 1 & 1 & 1 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \\ 4 & 5 & 6 & 7 \end{bmatrix}$$



(u)

$$\begin{aligned}x + y + z &= 1 \\ 2x - y + z &= 4 \\ x - 3y - 2z &= 2\end{aligned}$$

$$\Rightarrow \left[ \begin{array}{ccc|c} 1 & 1 & 1 & 1 \\ 2 & -1 & 1 & 4 \\ 1 & -3 & 2 & 2 \end{array} \right]$$

$$R_2 \rightarrow R_3$$

$$\left[ \begin{array}{ccc|c} 1 & 1 & 1 & 1 \\ 1 & -3 & -2 & 2 \\ 2 & 1 & 1 & 4 \end{array} \right]$$

$$R_2 \rightarrow R_2 - R_1$$

$$\left[ \begin{array}{ccc|c} 1 & 1 & 1 & 1 \\ 0 & -4 & -3 & 1 \\ 0 & -3 & -1 & 2 \end{array} \right]$$

$$R_3 \rightarrow R_3 - 2R_1$$

$$\left[ \begin{array}{ccc|c} 1 & 1 & 1 & 1 \\ 0 & -4 & -3 & 1 \\ 0 & -3 & -1 & 2 \end{array} \right]$$

$$R_2 \rightarrow R_2 - R_3$$

$$\left[ \begin{array}{ccc|c} 1 & 1 & 1 & 1 \\ 0 & -1 & -2 & -1 \\ 0 & -3 & -1 & 2 \end{array} \right]$$

$$R_3 \rightarrow R_3 - 3R_2$$

$$\left[ \begin{array}{ccc|c} 1 & 1 & 1 & 1 \\ 0 & -1 & -2 & -1 \\ 0 & 0 & 5 & 5 \end{array} \right]$$

$$R_3 \rightarrow R_3/5$$

$$\left[ \begin{array}{ccc|c} 1 & 1 & 1 & 1 \\ 0 & -1 & -2 & -1 \\ 0 & 0 & 1 & 1 \end{array} \right]$$

$$z = 1$$

$$-y - 2z = -1$$

$$y = -1$$

$$x + (-1) = 1$$

$$x = 1$$



Q) 3) Solve the following system of eq<sup>n</sup> by matrix method.

$$\begin{aligned} (1) \quad & x + y + z = 8 \\ & x - y + 2z = 6 \\ & 3x + 5y - 7z = 14 \end{aligned}$$

$$\rightarrow \left[ \begin{array}{ccc|c} 1 & 1 & 1 & 8 \\ 1 & -1 & 2 & 6 \\ 3 & 5 & -7 & 14 \end{array} \right]$$

$$R_2 \rightarrow R_2 - R_1$$

$$\left[ \begin{array}{ccc|c} 1 & 1 & 1 & 8 \\ 0 & -2 & 1 & -2 \\ 0 & 3 & -10 & -10 \end{array} \right]$$

$$R_3 \rightarrow R_3 + R_2$$

$$\left[ \begin{array}{ccc|c} 1 & 1 & 1 & 8 \\ 0 & -2 & 1 & -2 \\ 0 & 0 & -9 & -13 \end{array} \right]$$

$$z = 4/3$$

$$y = 5$$

$$x = 5$$

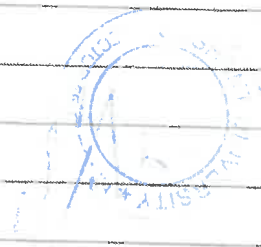
4) Show that the eq<sup>n</sup>  $x + 2y - z = 3$

$$3x - y + 2z = 1$$

$$2x - 2y + 3z = 2$$

$$x - y + z = -1$$

$$\rightarrow \left[ \begin{array}{ccc|c} 1 & 2 & -1 & 3 \\ 3 & -1 & 2 & 1 \\ 2 & -2 & 3 & 2 \\ 1 & -1 & 1 & -1 \end{array} \right]$$



875)

Test for consistency and solve  $\rightarrow$ 

$$5x + 3y + 7z = 4$$

$$3x + 26y + 22z = 9$$

$$7x + 2y + 10z = 5$$

$$\left[ \begin{array}{ccc|c} 5 & 3 & 7 & 4 \\ 3 & 26 & 22 & 9 \\ 7 & 2 & 10 & 5 \end{array} \right]$$

$$\rightarrow R_1 \rightarrow \frac{1}{5}R_1$$

$$\left[ \begin{array}{ccc|c} 1 & 3/5 & 7/5 & 4/5 \\ 3 & 26 & 22 & 9 \\ 7 & 2 & 10 & 5 \end{array} \right]$$

$$\rightarrow R_2 \rightarrow R_2 - 3R_1 \text{ and } R_3 \rightarrow R_3 - 7R_1$$

$$\left[ \begin{array}{ccc|c} 1 & 3/5 & 7/5 & 4/5 \\ 0 & 12/5 & 89/5 & 33/5 \\ 0 & -1/5 & 10 & -3/5 \end{array} \right]$$

$$\rightarrow R_3 \rightarrow \frac{1}{5}R_3$$

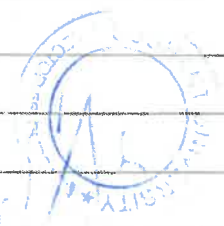
$$\left[ \begin{array}{ccc|c} 1 & 3/5 & 7/5 & 4/5 \\ 0 & 12/5 & 89/5 & 33/5 \\ 0 & 0 & 12/5 & 8/5 \end{array} \right]$$

$$\frac{12}{5}z = \frac{8}{5}$$

$$z = \frac{-113}{5}$$

$$y = \frac{-56}{121}$$

$$x = \frac{4}{5}$$



b)

$$\begin{aligned}x + y + 5z &= 0 \\x + 2y + 3az &= b \\x + 3y + az &= 1\end{aligned}$$

$$\left[ \begin{array}{ccc|c} 1 & 1 & 5 & 0 \\ 1 & 2 & 3a & b \\ 1 & 3 & a & 1 \end{array} \right]$$

$$R_2 \rightarrow R_2 - R_1$$

$$\left[ \begin{array}{ccc|c} 1 & 1 & 5 & 0 \\ 0 & 1 & 3a-5 & b \\ 1 & 3 & a & 1 \end{array} \right]$$

$$R_3 \rightarrow R_3 - R_1$$

$$\left[ \begin{array}{ccc|c} 1 & 1 & 5 & 0 \\ 0 & 1 & 3a-5 & b \\ 0 & 2 & a-5 & 1 \end{array} \right]$$

$$R_3 \rightarrow R_3 - 2R_2$$

$$\left[ \begin{array}{ccc|c} 1 & 1 & 5 & 0 \\ 0 & 1 & 3a-5 & b \\ 0 & 0 & 1 & 1 \end{array} \right]$$

(un) Infinite soln

$$P(A) = P(A:B) = n \leq n$$

$$n=3$$

$$\text{If } a=1, b=1/2$$

6) No solution

$$P(A) \neq P(A:B)$$

$$a=1, P(A)=3, b \neq 1/2, P(A:B)=4$$

h) A unique soln

$$P(A) = P(A:B) = n$$

$$n=3$$

if  $a \neq 1$  and  $b \in \mathbb{R}$   $b$  may have any value.

## Assignment - 4 Infinite Series

Q) Discuss the nature of series.

1)  $1 + 4 + 7 + 10 + \dots + \infty$

Here,  $a = 1$ ;  $d = 3$

$$S_n = n/2 [2a + (n-1)d]$$

$$= n/2 [2 + (n-1)3]$$

$$= n/2 (3n-1)$$

$$\lim_{n \rightarrow \infty} S_n = \lim_{n \rightarrow \infty} n/2 (3n-1)$$

$$= \infty$$

$\therefore$  the given series is divergent.

2)  $1 + 5/4 + 6/4 + 7/4 + \dots \rightarrow \infty$

by omitting first term.

$$a = 5/4, d = 1$$

$$S_n = n/2 [2/4 + (n-1)1]$$

$$= n/2 [5/2 + n - 1]$$

$$= n/2 [n + 3/2]$$

$$\lim_{n \rightarrow \infty} S_n = \lim_{n \rightarrow \infty} n/2 [n + 3/2] = \infty$$

$\therefore$  the given series is convergent.

3)  $3 + 3/2 + 3/2^2 + \dots + \infty$

Hence, the series is G.P.

$$a = 3, r = 1/2$$

$$\begin{aligned} \text{Sum of G.P.} \rightarrow S_n &= \frac{a(1-r^n)}{1-r} \quad \text{of } r < 1 \\ &= \frac{3(1-(1/2)^n)}{1-1/2} \end{aligned}$$

$$\lim_{n \rightarrow \infty} S_n = \frac{2}{3} + \left( \frac{1}{3 \cdot 2^n} \right)$$

$$= \frac{2}{3} \neq 0 \quad \therefore \text{finite quantity (q)}$$

7)  $\frac{1}{1 \cdot 2} + \frac{2}{1 \cdot 3} + \frac{3}{1 \cdot 4} + \dots \infty$

$$u_n = \frac{n}{1 \cdot 2 \cdot 3 \dots + (1 + (n-1)1)}$$

$$= \frac{n}{1 \cdot 2 \cdot 3 \dots n}$$

$$u_{n+1} = \frac{n+1}{1 \cdot 2 \cdot 3 \dots n(n+1)}$$

$$\frac{u_{n+1}}{u_n} = \frac{1}{\cancel{1 \cdot 2 \cdot 3 \dots n}} \times \frac{1 \cdot 2 \cdot 3 \dots n}{n}$$

$$= \frac{1}{n}$$

$$\lim_{n \rightarrow \infty} \frac{u_{n+1}}{u_n} = \frac{1}{n} = \frac{1}{\infty} = 0$$

So,  $0 < 1$ , Hence, given series is Convergent.

8)  $\sum \log n/n+1$

$$u_n = \log n - \log(n+1)$$

$$= \log n - \left\{ 1 + n + \frac{n^2}{2} - \frac{n^3}{3} \dots \right\}$$

$$u_n = \log \frac{n}{n+1}, \quad u_{n+1} = \log \frac{n+1}{n+2}$$

9)  $\sum (\sqrt{n+1} - \sqrt{n})$

$$u_n = \sqrt{n+1} - \sqrt{n}$$

dividing num and denominator by conjugate of

Here  $p = (2-0)$

$$p = 2$$

$$V_n = 1/n^2$$

$$\frac{U_n}{V_n} = \frac{1}{n(n+2)} \times n^{2n}$$

$$= n/n+2$$

$$\lim_{n \rightarrow \infty} \frac{U_n}{V_n} = n/n(1+2/n) = 1 \text{ a finite quantity.}$$

Now,  $\sum U_n$  is p series as  $p = 2 > 1$ .

$\therefore V_n$  is convergent.

So,  $U_n$  is also convergent.

44.  $\sum \frac{1}{n(n+1)(n+2)(n+3)}$

By Solving denomination

$$= (n^2+n)(n+2)(n+3)$$

$$= (n^3+2n^2+n^2+2n)(n+3)$$

$$= (n^3+3n^2+2n)(n+3)$$

$$= n^4+3n^3+3n^3+9n^2+2n^2+6n$$

$$= n^4+6n^3+11n^2+6n$$

$$\therefore V_n = 1/n^4+6n^3+11n^2+6n$$

$$V_n = 1/n^p = 1/n^4$$

$$\frac{U_n}{V_n} = \frac{n^4}{n^4+6n^3+11n^2+6n}$$

dividing num and denominator by  $n^4$

# Assignment-5

(1)  $2 + 3/2 \cdot 1/4 + 4/3 \cdot 1/4^2 + 5/4 \cdot 1/4^3 + \dots \infty$

$$U_n = \left[ \frac{n+1}{n} \cdot \frac{1}{4^{n-1}} \right]$$

$$U_{n+1} = \left[ \frac{n+2}{n+1} \cdot \frac{1}{4^n} \right]$$

$$\frac{U_{n+1}}{U_n} = \frac{n+2}{n+1} \cdot \frac{1}{4^n} \times \frac{4^n}{4} \times \frac{n}{n+1}$$

$$= \frac{n(n+2)}{4(n+1)}$$

$$= \frac{n^2 + 2n}{4n^2 + 8n + 4}$$

$$\lim_{n \rightarrow \infty} \frac{1+2/n}{4+8/n+4/n^2} = 1/4$$

$1/4 < 1$ , given series is cgt.

2.  $1 + 1 \cdot 2/1 \cdot 3 + 1 \cdot 2 \cdot 3/1 \cdot 3 \cdot 5 + \dots \infty$

$$U_n = \frac{1 \cdot 2 \cdot 3 \dots n}{1 \cdot 3 \cdot 5 \dots (2n+1)}$$

$$U_{n+1} = \frac{1 \cdot 2 \cdot 3 \dots n(n+1)}{1 \cdot 3 \cdot 5 \dots 2n-1(2n+1)}$$

$$\frac{U_{n+1}}{U_n} = \frac{1 \cdot 2 \cdot 3 \dots n(n-1)}{1 \cdot 3 \cdot 5 \dots (2n-1)(2n+1)} \times \frac{1 \cdot 3 \cdot 5 \dots (2n-1)}{1 \cdot 2 \cdot 3 \dots n}$$

$$= \frac{n+1}{2n+1}$$

$$\lim_{n \rightarrow \infty} \frac{U_{n+1}}{U_n} = \lim_{n \rightarrow \infty} \frac{n+1}{2n+1}$$

$$\lim_{n \rightarrow \infty} \frac{1+1/n}{2+1/n} = 1/2$$

$$= \frac{1 \times 2 \times 2}{2 \times 2}$$

$$= 4/4 = 1$$

So, ratio test fails.

Now, Apply Rubbe's test on

5.  $1 + \frac{2^2}{2!} + \frac{3^2}{3!} + \frac{4^2}{4!} + \dots \infty$

$$U_n = \frac{n^2}{n!}$$

$$U_{n+1} = \frac{(n+1)^2}{(n+1)!}$$

$$\frac{U_{n+1}}{U_n} = \frac{(n+1)^2}{(n+1)n!} \times \frac{n!}{n^2}$$

$$= \frac{(n+1)(n+1)}{(n+1)n}$$

$$\lim_{n \rightarrow \infty} \frac{n+1}{n^2}$$

$$= \frac{1 + 1/n}{n}$$

$$= 0$$

So,  $0 < 1$

$\therefore$  The given series cgt.

6.  $1/4 + 2/1+2^2 + \frac{3}{1+2^3} + \dots$

$$U_n = \frac{n}{1+2^n}$$

$$U_{n+1} = \frac{n+1}{1+2^{n+1}}$$

$$\lim_{n \rightarrow \infty} \frac{U_{n+1}}{U_n} = \lim_{n \rightarrow \infty} \left(1 + \frac{1}{n}\right)^n \cdot \left(\frac{1 + \frac{1}{n}}{1 + \frac{1}{n+1}}\right)^{n+2}$$

$$= e \cdot 1 = e$$

$e > 1$

$\therefore$  So the given series is divergent.

8)  $\frac{1}{3} + \frac{n!}{3^n} + \frac{3!}{3^2} + \dots \infty$

$$U_n = \frac{n!}{3^n}$$

$$U_{n+1} = \frac{(n+1)!}{3^{n+1}}$$

$$\frac{U_{n+1}}{U_n} = \frac{(n+1)!}{3^{n+1}} \times \frac{3^n}{n!}$$

$$\frac{U_{n+1}}{U_n} = \frac{1}{3} (n+1)$$

$$\lim_{n \rightarrow \infty} \frac{U_{n+1}}{U_n} = \frac{1}{3} \lim_{n \rightarrow \infty} (n+1)$$

$$= \infty$$

$\therefore$  The give series is divergent.

9)  $\sum \frac{2n^3+5}{4n^5+1} = U_n$

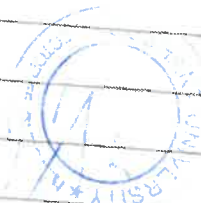
By comparison test

$$V_n = \frac{1}{n^p}$$

$$P = [5-3]$$

$$P > 2$$

$$\frac{U_n}{V_n} = \frac{2n^3+5}{4n^5+1} \times n^2$$



KEMEDIAL ASSIGNMENT  
matrices

Ex - 2.1

Name - Kumar  
B.tech, CSE  
1st Sem

① Reduce the triangular form

$$① \begin{bmatrix} 3 & -4 & -5 \\ -9 & 1 & 4 \\ -5 & 3 & 1 \end{bmatrix}$$

$$R_2 \rightarrow R_2 + 3R_1$$

$$\begin{bmatrix} 3 & -4 & 5 \\ 0 & -11 & -11 \\ -5 & 3 & 1 \end{bmatrix}$$

$$R_3 \rightarrow 3R_3 + 5R_1$$

$$\begin{bmatrix} 3 & -4 & -5 \\ 0 & -11 & -11 \\ 0 & -11 & -22 \end{bmatrix}$$

$$R_3 \rightarrow R_3 - R_2$$

$$\begin{bmatrix} 3 & -4 & -5 \\ 0 & -11 & -11 \\ 0 & 0 & -11 \end{bmatrix}$$

$$② \begin{bmatrix} 2 & 3 & -1 \\ 0 & -3 & 2 \\ -5 & 3 & 7 \end{bmatrix}$$

$$R_3 \rightarrow 5R_1 + 2R_3$$

$$\begin{bmatrix} 2 & 3 & -1 \\ 0 & -3 & 2 \\ 0 & 21 & 9 \end{bmatrix}$$

$$R_3 \rightarrow R_3 + 7R_2$$

$$\begin{bmatrix} 2 & 3 & -1 \\ 0 & -3 & 2 \\ 0 & 0 & -12 \end{bmatrix}$$

$$R_1 \rightarrow 3R_1 + 4R_3$$

$$\begin{bmatrix} -11 & 0 & -11 \\ -3 & 1 & 4 \\ -5 & 3 & 1 \end{bmatrix}$$

$$R_1 \rightarrow \frac{R_1}{11}$$

$$\begin{bmatrix} -1 & 0 & -1 \\ -3 & 1 & 4 \\ -5 & 3 & 1 \end{bmatrix}$$

$$R_1 \rightarrow R_1 + R_3$$

$$\begin{bmatrix} -6 & 3 & 0 \\ -3 & 1 & 4 \\ -5 & 3 & 1 \end{bmatrix}$$

$$R_2 \rightarrow R_2 - 4R_3$$

$$\begin{bmatrix} -6 & 3 & 0 \\ 11 & -11 & 0 \\ 5 & 3 & 1 \end{bmatrix}$$

$$R_1 \rightarrow 11R_1 + 3R_2$$

$$\begin{bmatrix} -33 & 0 & 0 \\ 11 & -11 & 0 \\ -5 & 3 & 1 \end{bmatrix}$$



$$\therefore R_3 \rightarrow R_3 + R_1$$

$$\begin{bmatrix} 2 & 4 & 0 \\ 0 & 2 & -10 \\ 0 & 4 & -24 \end{bmatrix} = \begin{bmatrix} 1 & 1 & 0 \\ 0 & 2 & 1 \\ 1 & 5 & 3 \end{bmatrix} A$$

$$R_1 \rightarrow \frac{1}{2} R_1$$

$$R_2 \rightarrow \frac{1}{2} R_2$$

$$R_3 \rightarrow \frac{1}{4} R_3$$

$$\begin{bmatrix} 1 & 2 & 0 \\ 0 & 1 & -5 \\ 0 & 1 & -6 \end{bmatrix} = \begin{bmatrix} 1/2 & 1/2 & 0 \\ 0 & 1 & 1/2 \\ 1/4 & 5/4 & 3/4 \end{bmatrix} A$$

$$R_3 \rightarrow R_3 - R_2$$

$$\begin{bmatrix} 1 & 2 & 0 \\ 0 & 1 & -5 \\ 0 & 0 & -1 \end{bmatrix} = \begin{bmatrix} 1/2 & 1/2 & 0 \\ 0 & 1 & 1/2 \\ 1/4 & 1/4 & 1/4 \end{bmatrix} A$$

$$R_2 \rightarrow R_2 - 5R_3$$

$$\begin{bmatrix} 1 & 2 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & -1 \end{bmatrix} = \begin{bmatrix} 1/2 & 1/2 & 0 \\ -3/4 & -1/4 & -3/4 \\ 1/4 & 1/4 & 1/4 \end{bmatrix} A$$

$$A^{-1} = \begin{bmatrix} 3 & 1 & 3/2 \\ -5/4 & -1/4 & -3/4 \\ -1/4 & -1/4 & -1/4 \end{bmatrix}$$



(ii)  $\begin{bmatrix} 3 & -3 & 4 \\ 2 & -3 & 4 \\ 0 & -1 & 1 \end{bmatrix}$  we have  
 $A = IA$

$$\begin{bmatrix} 3 & -3 & 4 \\ 2 & -3 & 4 \\ 0 & -1 & 1 \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix} A$$

$$R_1 \rightarrow R_1 - R_2$$

$$\begin{bmatrix} 1 & 0 & 0 \\ 0 & -3 & 4 \\ 0 & -1 & 1 \end{bmatrix} = \begin{bmatrix} 1 & -1 & 6 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix} A$$

$$R_2 \rightarrow R_2 - 4R_3$$

$$\begin{bmatrix} 1 & 0 & 0 \\ 2 & 1 & 0 \\ 0 & -1 & 1 \end{bmatrix} = \begin{bmatrix} 1 & -1 & 6 \\ 0 & 1 & -4 \\ 0 & 0 & 1 \end{bmatrix} A$$

$$R_2 \rightarrow R_2 - 2R_1$$

$$\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & -1 & 1 \end{bmatrix} = \begin{bmatrix} 1 & -1 & 6 \\ -2 & 3 & -4 \\ 0 & 0 & 1 \end{bmatrix} A$$

$$A^{-1} = \begin{bmatrix} 1 & -1 & 0 \\ 2 & 3 & -4 \\ -2 & 3 & -3 \end{bmatrix}$$

(iii)  $\begin{bmatrix} 1 & 2 & 5 \\ 2 & 3 & 1 \\ -1 & 1 & 1 \end{bmatrix}$  we have

$$\begin{bmatrix} 1 & 2 & 5 \\ 2 & 3 & 1 \\ -1 & 1 & 1 \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix} A$$

$$R_2 \rightarrow R_2 + 2R_3$$

$$\begin{bmatrix} 1 & 2 & 5 \\ 0 & 5 & 3 \\ -1 & 1 & 1 \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 2 \\ 0 & 0 & 1 \end{bmatrix} A$$

Ex-2.1

4. Find rank of the matrix

$$\textcircled{i} \begin{bmatrix} 2 & -1 & 0 & 5 \\ 0 & 3 & 1 & 1 \end{bmatrix}$$

$$\begin{vmatrix} 2 & -1 \\ 0 & 3 \end{vmatrix} = (6 - 0) = 6 \neq 0 \\ \rho(A) = 2$$

$$\textcircled{ii} \begin{bmatrix} 1 & 2 & 3 \\ 2 & 4 & 7 \\ 3 & 6 & 10 \end{bmatrix}$$

$$R_2 \rightarrow R_2 - 2R_1$$

$$\begin{bmatrix} 1 & 2 & 3 \\ 0 & 0 & 1 \\ 3 & 6 & 10 \end{bmatrix}$$

$$R_3 \rightarrow R_3 - 3R_1$$

$$\begin{bmatrix} 1 & 2 & 3 \\ 0 & 0 & 1 \\ 0 & 0 & 1 \end{bmatrix}$$

$$R_3 \rightarrow R_3 - R_2$$

$$\begin{bmatrix} 1 & 2 & 3 \\ 0 & 0 & 1 \\ 0 & 0 & 0 \end{bmatrix}$$

$$\rightarrow \begin{vmatrix} 1 & 2 \\ 0 & 0 \end{vmatrix} = 0 - 0 = 0$$

$$\begin{vmatrix} 2 & 3 \\ 0 & 1 \end{vmatrix} = 2 - 0 = 2 \neq 0 \quad \rho(A) = 2$$

or Cont.

$$C_2 \rightarrow C_3$$

$$\begin{bmatrix} 1 & 3 & 2 \\ 0 & 1 & 6 \\ 0 & 0 & 0 \end{bmatrix}$$

$$C_3 \rightarrow C_3 - 2C_1$$

$$\begin{bmatrix} 1 & 3 & 6 \\ 0 & 1 & 0 \\ 0 & 0 & 0 \end{bmatrix}$$

$$C_2 \rightarrow C_2 - 3C_1$$

$$\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 0 \end{bmatrix}$$

$$\begin{bmatrix} I_2 & 0 \\ 0 & 0 \end{bmatrix} = \rho(A) = 2$$

$$\textcircled{v)} \begin{bmatrix} 1 & 4 & 3 \\ 2 & 6 & 8 \\ 3 & 7 & 22 \end{bmatrix}$$

$$= 1(32 - 56) - 4(44 - 24) + 5(14 - 18)$$

$$76 - 80 - 20$$

$$\det(A) = 3$$

$$\textcircled{vi)} \begin{bmatrix} 2 & -4 & 6 \\ 1 & 2 & -3 \\ 3 & -6 & 3 \end{bmatrix}$$

$$R_3 \rightarrow \frac{1}{3} R_3$$

$$\begin{bmatrix} 2 & -4 & 6 \\ -1 & 2 & -3 \\ 1 & -2 & 3 \end{bmatrix}$$

$$R_3 \rightarrow R_3 + R_2$$

$$\begin{bmatrix} 2 & -4 & 6 \\ -1 & 2 & -3 \\ 0 & 0 & 0 \end{bmatrix}$$

$$R_1 \rightarrow \frac{1}{2} R_1$$

$$\begin{bmatrix} 1 & -2 & 3 \\ -1 & 2 & -3 \\ 0 & 0 & 0 \end{bmatrix}$$

$$R_2 \rightarrow R_2 + R_1$$

$$\begin{bmatrix} 1 & -2 & 3 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{bmatrix} \Rightarrow \det(A) = 1$$



$$\textcircled{11} \begin{bmatrix} 6 & 1 & 3 & 8 \\ 4 & 2 & 6 & -1 \\ 10 & 3 & 9 & 7 \\ 14 & 4 & 12 & 15 \end{bmatrix}$$

$$C_3 \rightarrow \frac{1}{3} C_3$$

$$\begin{bmatrix} 6 & 1 & 1 & 3 \\ 4 & 2 & 2 & -1 \\ 10 & 3 & 3 & 7 \\ 14 & 4 & 4 & 15 \end{bmatrix}$$

$$C_1 \rightarrow \frac{1}{2} C_1$$

$$C_3 \rightarrow C_3 - C_2$$

$$\begin{bmatrix} 3 & 1 & 0 & 8 \\ 2 & 2 & 0 & -1 \\ 5 & 3 & 0 & 7 \\ 8 & 4 & 0 & 15 \end{bmatrix}$$

$$C_3 \rightarrow C_4$$

$$\begin{bmatrix} 3 & 1 & 8 & 0 \\ 2 & 2 & -1 & 0 \\ 5 & 3 & 7 & 0 \\ 8 & 4 & 15 & 0 \end{bmatrix}$$

$$R_3 \rightarrow R_3 - R_2$$

$$\begin{bmatrix} 5 & 1 & 8 & 0 \\ 2 & 2 & -1 & 0 \\ 3 & 1 & 8 & 0 \\ 8 & 4 & 15 & 0 \end{bmatrix}$$

$$R_3 \leftrightarrow R_4$$

$$\begin{bmatrix} 3 & 1 & 8 & 0 \\ 2 & 2 & -1 & 0 \\ 3 & 4 & 15 & 0 \\ 0 & 0 & 0 & 0 \end{bmatrix}$$

$$= \boxed{\rho(A) = 2}$$



Q7: Find the rank of the matrix

$$\textcircled{1} \begin{bmatrix} 3 & -4 & -1 & 2 \\ 1 & 7 & 3 & 1 \\ 5 & -2 & 5 & 4 \\ 4 & -3 & 7 & 7 \end{bmatrix}$$

$$R_1 \rightarrow \frac{1}{3} R_1$$

$$\begin{bmatrix} 1 & -1/3 & -1/3 & 2/3 \\ 1 & 7 & 3 & 1 \\ 5 & -2 & 5 & 4 \\ 4 & -3 & 7 & 7 \end{bmatrix}$$

$$R_2 \leftarrow R_2 - R_1 \text{ and}$$

$$R_3 \rightarrow R_3 - 5R_1$$

$$\begin{bmatrix} 1 & -4/3 & -1/3 & 2/3 \\ 0 & 25/3 & 10/3 & 1/3 \\ 0 & 14/3 & 20/3 & 2/3 \\ 4 & -3 & 7 & 7 \end{bmatrix}$$

$$R_4 \rightarrow R_4 - 4R_1$$

$$R_2 \rightarrow \frac{3R_2}{25}$$

$$\begin{bmatrix} 1 & -4/3 & -1/3 & 2/3 \\ 0 & 1 & 2/5 & 1/25 \\ 0 & 14/3 & 20/3 & 2/3 \\ 0 & 9 & 16 & 1 \end{bmatrix}$$

$$R_3 \rightarrow R_3 - \frac{14}{3} R_2$$

$$R_4 \rightarrow R_4 - 9R_2$$

$$\begin{bmatrix} 1 & -4/3 & -1/3 & 2/3 \\ 0 & 1 & 2/5 & 1/25 \\ 0 & 0 & 24/5 & 12/25 \\ 0 & 0 & 32/5 & 16/25 \end{bmatrix}$$



$$R_2 \rightarrow R_2$$

$$R_3 \rightarrow R_3 - R_4$$

$$\begin{bmatrix} 1 & -2 & -3 & 2 \\ 0 & 1 & -7 & 12 \\ 0 & 0 & 0 & 0 \\ 0 & -2 & 14 & -4 \end{bmatrix}$$

$$R_4 \rightarrow R_4 + 2R_1$$

$$\begin{bmatrix} 1 & -2 & -3 & 2 \\ 0 & 1 & -7 & 12 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \end{bmatrix}$$

$$\rho(A) = 2$$

$$(iii) \begin{bmatrix} 2 & 4 & 3 & -2 \\ -3 & -2 & -1 & 4 \\ 6 & -1 & 7 & 2 \end{bmatrix}$$

$$R_2 \rightarrow \frac{1}{2} R_1$$

$$\begin{bmatrix} 1 & 2 & 3/2 & -1 \\ -3 & -2 & -1 & 4 \\ 6 & -1 & 7 & 2 \end{bmatrix}$$

$$R_2 \rightarrow R_2 + 3R_1$$

$$R_3 \rightarrow R_3 - 6R_1$$

$$\begin{bmatrix} 1 & 2 & 3/2 & -1 \\ 0 & 4 & 7/2 & 1 \\ 0 & -5 & -2 & 8 \end{bmatrix}$$

$$R_2 \rightarrow \frac{1}{4} R_2$$



Q10 Reduce the each of the following matrix to normal form and find their ranks.

① 
$$\begin{bmatrix} 0 & 2 & 3 & 4 \\ 2 & 3 & 5 & 4 \\ 4 & 8 & 13 & 12 \end{bmatrix}$$

$$R_1 \rightarrow R_2$$

$$\begin{bmatrix} 8 & 3 & 5 & 4 \\ 0 & 2 & 3 & 4 \\ 4 & 8 & 13 & 12 \end{bmatrix}$$

$$R_1 \rightarrow \frac{1}{2} R_1$$

$$\begin{bmatrix} 1 & 3/2 & 5/2 & 2 \\ 0 & 2 & 3 & 4 \\ 4 & 8 & 13 & 12 \end{bmatrix}$$

$$R_3 \rightarrow R_3 - 4R_1$$

$$\begin{bmatrix} 1 & 3/2 & 5/2 & 2 \\ 0 & 2 & 3 & 4 \\ 0 & 2 & 3 & 4 \end{bmatrix}$$

$$C_2 \rightarrow C_2 - C_3$$

$$C_4 \rightarrow \frac{1}{2} C_4$$

$$\begin{bmatrix} 1 & -1 & 5/2 & 1 \\ 0 & -1 & 3 & 2 \\ 0 & -1 & 3 & 2 \end{bmatrix}$$

$$C_2 \rightarrow C_2$$

$$\begin{bmatrix} 1 & 1 & 5/2 & 1 \\ 0 & 1 & 3 & 2 \\ 0 & 1 & 3 & 2 \end{bmatrix}$$



$$f(A) = 3$$

$$\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 0 \end{bmatrix} = [I_3 \mid 0]$$

$$\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 11/2 \end{bmatrix}$$

$$R_3 \rightarrow \frac{11}{2} R_3$$

$$\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 11/2 \end{bmatrix}$$

$$C_4 \rightarrow C_4 - \frac{2}{5} C_2$$

$$C_3 \rightarrow C_3 + \frac{1}{2} C_2$$

$$\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 11/2 \\ 0 & 0 & 11/2 \end{bmatrix}$$

$$C_4 \rightarrow C_4 - C_1$$

$$C_2 \rightarrow C_2 - 2C_1$$

$$\begin{bmatrix} 1 & 2 & 0 & -1 \\ 0 & 1 & 11/2 & 5/2 \\ 0 & 0 & 11/2 & 4/2 \end{bmatrix}$$

$$R_3 \rightarrow -7R_2$$

$$R_2 \rightarrow -\frac{2}{11} R_2$$

$$\begin{bmatrix} 1 & 2 & 0 & -1 \\ 0 & -2 & 1 & 5 \\ 0 & 7 & 2 & 3 \end{bmatrix}$$



Ex 2.2

3. solve the following systems of equation by

$$\begin{aligned} \textcircled{1} \quad & x + y + z = 8 \\ & x - y + 2z = 6 \\ & 3x + 5y - 7z = 14 \end{aligned}$$

sol

$$\begin{bmatrix} 1 & 1 & 1 & : & 8 \\ 1 & -1 & 2 & : & 6 \\ 3 & 5 & -7 & : & 14 \end{bmatrix}$$

$$\begin{aligned} R_2 &\rightarrow R_2 + (-R_1) \\ R_3 &\rightarrow R_3 + (-3R_1) \end{aligned}$$

$$\begin{bmatrix} 1 & 1 & 1 & : & 8 \\ 0 & -2 & 1 & : & -2 \\ 0 & 2 & -10 & : & -10 \end{bmatrix}$$

$$R_3 \rightarrow \frac{1}{2} R_3 \text{ and } R_1 \rightarrow R_1 + (-R_2)$$

$$\begin{bmatrix} 1 & 3 & 0 & : & 10 \\ 0 & -2 & 1 & : & -2 \\ 0 & 1 & -5 & : & -5 \end{bmatrix}$$

$$R_3 \rightarrow R_3 + 5R_2$$

$$\begin{bmatrix} 1 & 3 & 0 & : & 10 \\ 0 & -2 & 1 & : & -2 \\ 0 & -9 & 0 & : & -15 \end{bmatrix}$$

$$R_3 \rightarrow -\frac{1}{9} R_3$$

$$\begin{bmatrix} 1 & 3 & 0 & : & 10 \\ 0 & -2 & 1 & : & -2 \\ 0 & 1 & 0 & : & 5/3 \end{bmatrix}$$

$$R_1 \rightarrow R_1 + (-3R_3)$$

$$R_2 \rightarrow R_2 + 2R_3$$

$$\begin{bmatrix} 1 & 0 & 0 & : & 5 \\ 0 & 0 & 1 & : & 4/3 \\ 0 & 1 & 0 & : & 5/3 \end{bmatrix}$$

$$\text{Here } \begin{cases} x = 5 \\ y = 5/3 \\ z = -4/3 \end{cases} \quad a=1$$

*(Handwritten signature)*



5) Ans

It can be written  $\frac{1}{1^2} + \frac{1}{2^{-2}} + \frac{1}{3^{-2}} + \frac{1}{4^{-2}} + \dots \frac{1}{n^{-2}}$

Here

it represent the p series and  $p = -2$

Here

$$p < 1$$

$\therefore$  So the given is divergent.

6) Ans

$$GP \rightarrow 1 + \left(-\frac{1}{2}\right) + \left(-\frac{1}{2}\right)^2 + \left(-\frac{1}{2}\right)^3 + \left(-\frac{1}{2}\right)^4 + \dots$$

$$a = 1 \quad r = -\frac{1}{2}$$

$$S_n = \frac{a(1 - r^n)}{1 - r}$$

$$= \frac{1(1 - (-1/2)^n)}{1 + \frac{1}{2}}$$

$$\frac{2}{3} (1 - (-1/2)^n)$$

$$\frac{2}{3} - \frac{2}{3} \left(-\frac{1}{2^n}\right)$$

Lim  
 $S \rightarrow \infty$

$$S_n \quad \frac{2}{3} + \left(\frac{1}{3 \cdot 2^{n-1}}\right)$$

$$\frac{2}{3} + 0$$

(Given series is convgt.)



$$\frac{u_{n+1}}{u_n} = \frac{1}{\cancel{1 \cdot 2 \cdot 3} \dots n} \times \frac{\cancel{1 \cdot 2 \cdot 3} \dots n}{n}$$

$$= \frac{1}{n}$$

$$\lim_{n \rightarrow \infty} \frac{u_{n+1}}{u_n} = \frac{1}{n}$$

$$= \frac{1}{\infty} = 0$$

$$0 < 1$$

∴ Hence given series is convergent.

11) Ans  $\sum (\sqrt{n+1} - \sqrt{n})$

$$u_n = \sqrt{n+1} - \sqrt{n}$$

Dividing Num and denominator by Conjugate of  $\sqrt{n+1} - \sqrt{n}$

$$\frac{\sqrt{n+1} - \sqrt{n} \times \sqrt{n+1} + \sqrt{n}}{\sqrt{n+1} + \sqrt{n}}$$

$$= \frac{(n+1) - n}{\sqrt{n+1} + \sqrt{n}} = \frac{1}{\sqrt{n+1} + \sqrt{n}}$$

$$u_n = \frac{1}{n^p} \quad \text{Here } p \left( \frac{1}{2} > 0 \right)$$

$$= \frac{1}{\sqrt{n}} \quad = \frac{1}{2}$$



$$\therefore U_n = \frac{1}{n}$$

$$\text{Here } p = (2 - 0)$$

$$p = 2$$

$$U_n = \frac{1}{n^2}$$

$$\frac{U_n}{U_{n+1}} = \frac{1}{\cancel{n}^2 (n+1)^2} \times \cancel{n}^2$$

$$= \frac{n}{n+1}$$

$$\lim_{n \rightarrow \infty} \frac{U_n}{U_{n+1}} = \frac{1}{1 + 1/n}$$

$$= 1$$

a finite quantity

Now  $\sum U_n$  is p series as

$$p = 2 > 1$$

$\therefore U_n$  is convergent

So,  $a_n$  is also convergent.

13) Ans

$$= (n^2 + n) / (n+2)(n+3)$$

$$= (n^3 + 2n^2 + n^2 + 2n) / (n+3)$$

$$= (n^3 + 3n^2 + 2n) / (n+3)$$

$$= n^4 + 3n^3 + 3n^3 + 9n^2 + 2n^2 + 6n$$

$$= n^4 + 6n^3 + 11n^2 + 6n$$



So:  $u_n = \frac{n}{n^3 + 6n^2 + 11n + 6}$

$$u_n = \frac{1}{n^p} \quad p = [3-1]$$

$$p = 2$$

$$= \frac{1}{n^2}$$

$$\frac{u_n}{u_n} = \frac{n^3}{n^3 + 6n^2 + 11n + 6}$$

Dividing Num & Den by  $n^3$

$$\lim_{n \rightarrow \infty} \frac{u_n}{u_n} = \frac{1}{1 + \frac{6}{n} + \frac{11}{n^2} + \frac{6}{n^3}}$$

$= 1$ , a finite quantity

Here  $p = 2 > 1$

$u_n$  is convergent as  $u_n$  is also convergent.



## Assignment -5

①  
Ans  $U_n = \left[ \frac{n+1}{n} \cdot \frac{1}{4^{n-1}} \right]$

$$U_{n+1} = \left[ \frac{n+2}{n+1} \cdot \frac{1}{4^n} \right]$$

$$\frac{U_{n+1}}{U_n} = \frac{n+2}{n+1} \cdot \frac{1}{4^n} \times \frac{4^n}{1} \times \frac{n}{n+1}$$

$$= \frac{n(n+2)}{4(n+1)^2}$$

$$= \frac{n^2 + 2n}{4n^2 + 8n + 4}$$

$$\lim_{n \rightarrow \infty} \frac{1 + 2/n}{4 + 8/n + 4/n^2}$$

$$= \frac{1}{4}$$

$\frac{1}{4} < 1$  is given series gt.

Q2 Ans

$$U_n = \frac{1 \cdot 2 \cdot 3 \cdot \dots \cdot n}{1 \cdot 3 \cdot 5 \cdot \dots \cdot (1 + (n+1)2)}$$

$$\frac{1 \cdot 2 \cdot 3 \cdot \dots \cdot n}{1 \cdot 3 \cdot 5 \cdot \dots \cdot (2n-1)}$$



$$= \frac{2n+1}{2n^2-n+2n-1}$$

$$\lim_{n \rightarrow \infty} \frac{n(2 + 1/n)}{n^2(2 + 1/n - 1/n^2)}$$

$$= \frac{2}{\infty} = 0$$

$0 < 1$  and the series is  $g^t$ .

Ans

$$u_n = \frac{n}{(2n-1)(2n)}$$

$$u_{n+1} = \frac{n+1}{(2n+1)(2n+2)}$$

$$\frac{u_{n+1}}{u_n} = \frac{(n+1)}{(2n+1)(2n+2)} \times \frac{(2n+1)(2n)}{n}$$

$$\frac{n(1 + 1/n) \cdot n(2 - 1/n)}{n(2 + 1/n) \cdot n(2 + 2/n)}$$

$$\lim_{n \rightarrow \infty} \left( \frac{(1 + 1/n) \times (2 - 1/n)}{(2 + 1/n)(2 + 2/n)} \right)$$

$$\frac{(1) \times (2) \cdot (2)}{(2) \times (2)} = \frac{4}{4} = 1$$

ratio test fails.



So by Raabe's Test

$$n \left( \frac{u_n - 1}{u_{n+1}} \right) = n \left( \frac{4n^3 + 8n^2 + 2n + 3n - 1}{4n^3 + 4n^2 - n - 1} \right)$$

$$= n \left( \frac{4n^3 + 6n^2 + 2n + 3n - 4n^3 - 4n^2 + n + 1}{4n^3 + 4n^2 - n - 1} \right)$$

$$= n \left( \frac{2n^2 + 6n + 1}{4n^3 + 4n^2 - n - 1} \right)$$

$$= \frac{2n^3 + 6n^2 + 1n}{4n^3 + 4n^2 - n - 1}$$

$$\lim_{n \rightarrow \infty} \left[ n \left( \frac{u_n}{u_{n+1}} - 1 \right) \right] = \frac{2 + 6/n + 1/n^2}{4 + 4/n - 1/n^2 - 1/n^3}$$

$$= \frac{2}{4} = \frac{1}{2}$$

$$\text{So } \frac{1}{2} < 1$$

the given series is divergent

Ans

$$u_n = \frac{n^2}{\ln n}$$

$$u_{n+1} = \frac{(n+1)^2}{\ln(n+1)}$$

$$\frac{u_{n+1}}{u_n} = \frac{(n+1)^2}{(n+1) \sqrt[n]{n}} \times \frac{\cancel{u_n}}{n^2}$$



Q) Ans

By omitting

$$u_n = \frac{n^n}{(n+1)^{n+1}}$$

$$u_{n+1} = \frac{(n+1)^{n+1}}{(n+2)^{n+2}}$$

$$\frac{u_{n+1}}{u_n} = \frac{(n+1)^{n+1}}{(n+2)^{n+2}} \times \frac{(n+1)^{n+1}}{n^n}$$

$$= \frac{(n+1)^{2n+2}}{n^2(n+2)^{n+2}}$$

$$\frac{u_{n+1}}{u_n} = \frac{(n+1)^n (n+1)^{n+2}}{n^n (n+2)^{n+2}} = \left(\frac{n+1}{n}\right)^n \cdot \left(\frac{n+1}{n+2}\right)^{n+2}$$

$$\begin{aligned} \lim_{n \rightarrow \infty} \frac{u_{n+1}}{u_n} &= \lim_{n \rightarrow \infty} \left(1 + \frac{1}{n}\right)^n \cdot \left(\frac{1 + 1/n}{1 + 2/n}\right)^{n+2} \\ &= e \cdot 1 \\ &= e \end{aligned}$$

$$e > 1$$

$\therefore$  The given series is divergent

7) Ans

$$u_n = \frac{\ln}{3^n}$$

$$u_{n+1} = \frac{\ln+1}{3^{n+1}}$$



## Assignment-6

1) Ans  $\sum \frac{n^2}{3^n}$

$$u_n = \frac{n^2}{3^n}$$

$$u_{n+1} = \frac{(n+1)^2}{3^{n+1}}$$

$$\frac{u_{n+1}}{u_n} = \frac{(n+1)^2}{\cancel{3} \cdot 3} \times \frac{\cancel{3}}{n^2}$$

$$= \frac{n^2 + 2n + 1}{3n^2}$$

$$\lim_{n \rightarrow \infty} \frac{u_{n+1}}{u_n} = \frac{n^2}{n^2} \left( \frac{1 + 2/n + 1/n^2}{3} \right)$$

$$= \frac{1}{3}$$

$$\frac{1}{3} < 1$$

So given series is convergent.

1) Ans

$$u_n = \left( \frac{1 \cdot 2 \cdot 3 \cdots n}{3 \cdot 5 \cdot 7 \cdots (2n+1)} \right)^2$$

$$u_{n+1} = \left( \frac{1 \cdot 2 \cdot 3 \cdots n(n+1)}{3 \cdot 5 \cdot 7 \cdots (2n+1)(2n+3)} \right)^2$$

$$\frac{u_{n+1}}{u_n} = \frac{\cancel{1 \cdot 2 \cdot 3 \cdots n} (n+1)}{\cancel{3 \cdot 5 \cdot 7 \cdots (2n+1)} (2n+3)} \times \frac{\cancel{3 \cdot 5 \cdot 7 \cdots (2n+1)}}{\cancel{1 \cdot 2 \cdot 3 \cdots n}}$$



$$= \frac{1}{e}.$$

$$\frac{1}{e} < 1$$

∴ The given series is convergent.

4) Ans

$$\sum \frac{n \cdot 2^n}{n^n}$$

$$u_{n+1} = \frac{(n+1) \cdot 2^{n+1}}{(n+1)^{n+1}}$$

$$= \frac{(n+1) \cdot 2^n \cdot 2}{(n+1)^2 (n+1)} \quad \vee \quad \frac{n^n}{4 \cdot 2^n}$$

$$= 2 \left( \frac{n}{n+1} \right)^n$$

$$\lim_{n \rightarrow \infty} = \frac{2 \cdot 1}{(1 + 1/n)^n}$$

$$= \frac{2}{e}$$

$$\frac{2}{e} < 1$$

∴ The given series is convergent.



*[Handwritten signature]*



## Assignment - 2

Q Discuss the nature of following series.

1) Ans Here  $a=1$ ,  $d=3$

$$S_n = \frac{n}{2} [2a + (n-1)d]$$

$$= \frac{n}{2} [2 + (n-1)3]$$

$$= \frac{n}{2} (2n + 3n - 3)$$

$$= \frac{n}{2} (3n - 1)$$

$$\lim_{n \rightarrow \infty} S_n = \frac{n}{2} (3n - 1) \\ = \infty$$

$\therefore$  Divergent Series.

2) Ans Omitting first term

$$a = \frac{5}{4}, d = 1$$

$$S_n = \frac{n}{2} [2 + (n-1)1]$$

$$\frac{n}{2} \left[ \frac{5}{2} + n - 1 \right]$$

$$\frac{n}{2} \left[ n + \frac{3}{2} \right]$$

$$\lim_{n \rightarrow \infty} S_n = \frac{n}{2} \left[ n + \frac{3}{2} \right] \\ = \infty$$

$\therefore$  divergent.

*[Signature]*



ANNEXURE-II

**School of Engineering & Technology, Sushant University**

Course Title: Mathematics I

Semester: I

Course Code: 23BTC-OMA11T

Course Faculty: Dr. Manimala

Programme: B.Tech

Sir/Madam,

Following students mentioned in the list are identified as Advanced learner based on guidelines issued by IQAC after second assessment (declaration of Mid-term marks).

| S No | Roll No          | Student Name         |
|------|------------------|----------------------|
| 1    | 240BTCCSE01<br>8 | Harshit Kumar Pandey |
| 2    | 240BTCCSE04<br>6 | KYATHIKA RAO SEELAM  |
|      |                  |                      |
|      |                  |                      |
|      |                  |                      |
|      |                  |                      |
|      |                  |                      |
|      |                  |                      |
|      |                  |                      |
|      |                  |                      |

Signature of Course Coordinator/Faculty

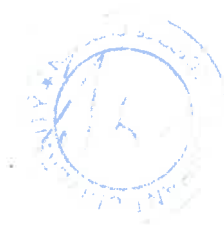
*Manimala*

Programme Coordinator

*[Signature]*

Dean

*[Signature]*



# list of Questions

Q1. Find the characteristic equation of the matrix,  $A = \begin{bmatrix} 2 & 1 & 1 \\ 0 & 1 & 0 \\ 1 & 1 & 2 \end{bmatrix}$  and hence compute  $A^{-1}$ . Also find the matrix represented by  $A^8 - 5A^7 + 7A^6 - 3A^5 + A^4 - 5A^3 + 8A^2 - 2A + I$ .

Q2. Verify Cayley-Hamilton Theorem for the matrix  $A = \begin{bmatrix} 1 & 2 & 3 \\ 2 & 4 & 5 \\ 3 & 5 & 6 \end{bmatrix}$  and hence find the inverse of  $A$ . Find  $A^4$ . Express  $B = A^8 - 11A^7 - 4A^6 + A^5 + A^4 - 11A^3 - 3A^2 + 2A + I$ , as a quadratic polynomial. Find  $B$ .

Q3. Discuss the convergence of the hypergeometric series  $1 + \frac{\alpha \cdot \beta}{1 \cdot \gamma} x + \frac{\alpha(\alpha+1)\beta(\beta+1)}{1 \cdot 2 \cdot \gamma \cdot (\gamma+1)} x^2 + \frac{\alpha(\alpha+1)(\alpha+2)\beta(\beta+1)(\beta+2)}{1 \cdot 2 \cdot 3 \cdot \gamma(\gamma+1)(\gamma+2)} x^3 + \dots \infty$

Q4. Separate  $\tan^{-1}(x+iy)$  into real and imaginary parts.

Q5. If  $Z$  is a homogeneous function, of degree  $n$  in  $x$  and  $y$ , show that  $x^2 \frac{\partial^2 Z}{\partial x^2} + 2xy \frac{\partial^2 Z}{\partial x \partial y} + y^2 \frac{\partial^2 Z}{\partial y^2} = n(n-1)Z$ .



# Answers

1. The characteristic eq<sup>n</sup> of the matrix  $A$  is

$$\begin{vmatrix} 2-\lambda & 1 & 1 \\ 0 & 1-\lambda & 0 \\ 1 & 1 & 2-\lambda \end{vmatrix} = 0$$

$$\Rightarrow \lambda^3 - 5\lambda^2 + 7\lambda - 3 = 0.$$

Acc. to Cayley-Hamilton Theorem, we have  $A^3 - 5A^2 + 7A - 3I = 0$ .  
- ①

Multiplying eq ① by  $A^{-1}$ ,

$$A^2 - 5A + 7I - 3A^{-1} = 0$$

$$A^{-1} = \frac{1}{3} (A^2 - 5A + 7I).$$

$$A^2 = \begin{bmatrix} 2 & 1 & 1 \\ 0 & 1 & 0 \\ 1 & 1 & 2 \end{bmatrix} \begin{bmatrix} 2 & 1 & 1 \\ 0 & 1 & 0 \\ 1 & 1 & 2 \end{bmatrix} = \begin{bmatrix} 4+0+1 & 2+1+1 & 2+0+2 \\ 0+0+0 & 0+1+0 & 0+0+0 \\ 2+0+2 & 1+1+2 & 1+0+4 \end{bmatrix}$$
$$= \begin{bmatrix} 5 & 4 & 4 \\ 0 & 1 & 0 \\ 4 & 4 & 5 \end{bmatrix}.$$

$$A^2 - 5A + 7I = \begin{bmatrix} 5 & 4 & 4 \\ 0 & 1 & 0 \\ 4 & 4 & 5 \end{bmatrix} - 5 \begin{bmatrix} 2 & 1 & 1 \\ 0 & 1 & 0 \\ 1 & 1 & 2 \end{bmatrix} + 7 \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$$
$$= \begin{bmatrix} 2 & -1 & -1 \\ 0 & 3 & 0 \\ -1 & -1 & 2 \end{bmatrix}.$$

$$\Rightarrow A^{-1} = \frac{1}{3} \begin{bmatrix} 2 & -1 & -1 \\ 0 & 3 & 0 \\ -1 & -1 & 2 \end{bmatrix}.$$



$$A^3 = A \cdot A^2 = \begin{bmatrix} 1 & 2 & 3 \\ 2 & 4 & 5 \\ 3 & 5 & 6 \end{bmatrix} \begin{bmatrix} 14 & 25 & 31 \\ 25 & 45 & 56 \\ 31 & 56 & 70 \end{bmatrix}$$

$$= \begin{bmatrix} 157 & 283 & 353 \\ 283 & 510 & 636 \\ 353 & 636 & 793 \end{bmatrix}$$

Verification:-

$$A^3 - 11A^2 - 4A + I = \begin{bmatrix} 157 & 283 & 353 \\ 283 & 510 & 636 \\ 353 & 636 & 793 \end{bmatrix} - 11 \begin{bmatrix} 14 & 25 & 31 \\ 25 & 45 & 56 \\ 31 & 56 & 70 \end{bmatrix} - 4 \begin{bmatrix} 1 & 2 & 3 \\ 2 & 4 & 5 \\ 3 & 5 & 6 \end{bmatrix} + \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

$$= \begin{bmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{bmatrix}$$

To find  $A^{-1}$ :-

$$A^3 - 11A^2 - 4A + I = 0 \quad (1)$$

Multiplying eq. (1) by  $A^{-1}$ ,

$$A^2 - 11A - 4I + A^{-1} = 0.$$

$$A^{-1} = -A^2 + 11A + 4I$$

$$\Rightarrow A^{-1} = - \begin{bmatrix} 14 & 25 & 31 \\ 25 & 45 & 56 \\ 31 & 56 & 70 \end{bmatrix} + 11 \begin{bmatrix} 1 & 2 & 3 \\ 2 & 4 & 5 \\ 3 & 5 & 6 \end{bmatrix} + 4 \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

$$= \begin{bmatrix} 1 & -3 & 2 \\ -3 & 3 & -1 \\ 2 & -1 & 0 \end{bmatrix}$$

To find  $A^{-4}$ :- From Cayley-Hamilton Theorem.

$$A^3 - 11A^2 - 4A + I = 0$$

$$A^3 = 11A^2 + 4A - I$$

Multiplying both sides by  $A$

$$A^4 = 11A^3 + 4A^2 - A.$$



$$= \lim_{n \rightarrow \infty} \frac{(1 + 1/n)(1 + r/n)}{(1 + \alpha/n)(1 + \beta/n)} \cdot \frac{1}{x} = \frac{1}{x}$$

$\therefore$  By Ratio test,

the series converges for  $\frac{1}{x} > 1$ , i.e.,  $x < 1$ ,

and diverges for  $x > 1$ .

it fails for  $x = 1$ .

Let us try Raabe's Test,

$$\begin{aligned} \lim_{n \rightarrow \infty} n \left( \frac{u_n}{u_{n+1}} - 1 \right) &= \lim_{n \rightarrow \infty} n \left\{ \frac{(n+1)(n+r)}{(n+\alpha)(n+\beta)} - 1 \right\} \\ &= \lim_{n \rightarrow \infty} \left\{ \frac{n(1+r-\alpha) + r - \alpha\beta}{n^2 + n(\alpha+\beta) + \alpha\beta} \right\} \\ &= \lim_{n \rightarrow \infty} \left\{ \frac{1+r-\alpha-\beta + (r-\alpha\beta)\frac{1}{n}}{1 + (\alpha+\beta)\frac{1}{n} + \alpha\beta\frac{1}{n^2}} \right\} \\ &= \underline{1+r-\alpha-\beta}. \end{aligned}$$

Thus, the series converges for  $1+r-\alpha-\beta > 1$ , i.e., for  $r > \alpha+\beta$ , and diverges for  $r < \alpha+\beta$ . But it fails for  $r = \alpha+\beta$ . Since,  $\frac{u_n}{u_{n+1}}$  does not involve  $n$  as an exponent or a logarithm, the series  $\sum u_n$  diverges for  $r = \alpha+\beta$ .

Hence the series converges for  $x < 1$  and diverges for  $x > 1$ , when  $x = 1$ , the series converges for  $r > \alpha+\beta$  and diverges for  $r \leq \alpha+\beta$ .

Differentiating Partially w.r.t.  $y$ ,

$$\frac{\partial}{\partial y} \left( x \frac{\partial z}{\partial x} + y \frac{\partial z}{\partial y} \right) = \frac{\partial}{\partial y} (nz)$$

$$\frac{\partial z}{\partial y} + x \frac{\partial^2 z}{\partial y \partial x} + y \frac{\partial^2 z}{\partial y^2} = n \frac{\partial z}{\partial y}$$

$$\Rightarrow x \frac{\partial^2 z}{\partial x \partial y} + y \frac{\partial^2 z}{\partial y^2} = (n-1) \frac{\partial z}{\partial y} \quad \text{--- (5)}$$

Multiplying eq (3) by  $x$  and (5) by  $y$ , then add,

$$x^2 \frac{\partial^2 z}{\partial x^2} + xy \frac{\partial^2 z}{\partial x \partial y} + xy \frac{\partial^2 z}{\partial x \partial y} + y^2 \frac{\partial^2 z}{\partial y^2} = x(n-1) \frac{\partial z}{\partial x} + y(n-1) \frac{\partial z}{\partial y}$$

$$x^2 \frac{\partial^2 z}{\partial x^2} + 2xy \frac{\partial^2 z}{\partial x \partial y} + y^2 \frac{\partial^2 z}{\partial y^2} = (n-1) \left( x \frac{\partial z}{\partial x} + y \frac{\partial z}{\partial y} \right)$$

From, eq (1),

$$x \frac{\partial z}{\partial x} + y \frac{\partial z}{\partial y} = nz$$

$$x^2 \frac{\partial^2 z}{\partial x^2} + 2xy \frac{\partial^2 z}{\partial x \partial y} + y^2 \frac{\partial^2 z}{\partial y^2} = (n-1)nz$$

Hence, Proved.



# Exercise 2.1 Remedial Assignment 1

NAME - SANA GHOSH

Ques 1 Reduce to triangular form.

$$(i) \begin{bmatrix} 3 & -4 & -5 \\ -9 & 1 & 4 \\ -5 & 3 & 1 \end{bmatrix}$$

$$R_2 \rightarrow 3R_1 + R_2$$

$$\begin{bmatrix} 3 & -4 & -5 \\ 0 & -11 & -11 \\ -5 & 3 & 1 \end{bmatrix}$$

$$R_3 \rightarrow \frac{3R_3}{5} + R_1$$

$$\begin{bmatrix} 3 & -4 & -5 \\ 0 & -11 & -11 \\ 0 & -1/5 & -22/5 \end{bmatrix}$$

$$R_3 \rightarrow \frac{R_2}{5} - R_3$$

$$\begin{bmatrix} 3 & -4 & -5 \\ 0 & -11 & -11 \\ 0 & 0 & 1/5 \end{bmatrix}$$

upper triangular form

$$(ii) \begin{bmatrix} 2 & 3 & -1 \\ 0 & -3 & 2 \\ -5 & 3 & 7 \end{bmatrix}$$

$$R_2 \rightarrow 2R_3 + 5R_1$$

$$\begin{bmatrix} 2 & 3 & -1 \\ 0 & -3 & 2 \\ 0 & 21 & 9 \end{bmatrix}$$

$$R_3 \rightarrow R_3 + 7R_2$$

$$\begin{bmatrix} 2 & 3 & -1 \\ 0 & -3 & 2 \\ 0 & 0 & -5 \end{bmatrix}$$

upper triangular form

$$R_1 \rightarrow R_1 + 5R_3$$

$$\begin{bmatrix} -22 & 11 & 0 \\ -9 & 1 & 4 \\ -5 & 3 & 1 \end{bmatrix}$$

$$R_2 \rightarrow R_2 - 4R_3$$

$$\begin{bmatrix} -22 & 11 & 0 \\ 11 & -11 & 0 \\ -5 & 3 & 1 \end{bmatrix}$$

$$R_1 \rightarrow R_1 + R_2$$

$$\begin{bmatrix} -11 & 0 & 0 \\ 11 & -11 & 0 \\ -5 & 3 & 1 \end{bmatrix}$$

lower triangular form

$$R_1 \rightarrow 2R_1 + R_2$$

$$\begin{bmatrix} 4 & 3 & 0 \\ 0 & -3 & 2 \\ -5 & 3 & 7 \end{bmatrix}$$

$$R_2 \rightarrow 7R_2 - 2R_3$$

$$\begin{bmatrix} 4 & 3 & 0 \\ 10 & -27 & 0 \\ -5 & 3 & 7 \end{bmatrix}$$

$$R_1 \rightarrow 9R_1 + R_2$$

$$\begin{bmatrix} 46 & 0 & 0 \\ 10 & -27 & 0 \\ -5 & 3 & 7 \end{bmatrix}$$

lower triangular form



$$2(ii) \begin{bmatrix} 2 & 0 & -1 \\ 5 & 1 & 0 \\ 0 & 1 & 3 \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix} A$$

$$R_1 \rightarrow R_1/2$$

$$\begin{bmatrix} 1 & 0 & -1/2 \\ 5 & 1 & 0 \\ 0 & 1 & 3 \end{bmatrix} = \begin{bmatrix} 1/2 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix} A$$

$$R_2 \rightarrow R_2 - 5R_1$$

$$\begin{bmatrix} 1 & 0 & -1/2 \\ 0 & 1 & 5/2 \\ 0 & 1 & 3 \end{bmatrix} = \begin{bmatrix} 1/2 & 0 & 0 \\ -5/2 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix} A$$

$$R_3 \rightarrow R_3 - R_2$$

$$\begin{bmatrix} 1 & 0 & -1/2 \\ 0 & 1 & 5/2 \\ 0 & 0 & 1/2 \end{bmatrix} = \begin{bmatrix} 1/2 & 0 & 0 \\ -5/2 & 1 & 0 \\ 5/2 & -1 & 1 \end{bmatrix} A$$

$$R_3 \rightarrow 2R_3$$

$$\begin{bmatrix} 1 & 0 & -1/2 \\ 0 & 1 & 5/2 \\ 0 & 0 & 1 \end{bmatrix} = \begin{bmatrix} 1/2 & 0 & 0 \\ -5/2 & 1 & 0 \\ 5 & -2 & 2 \end{bmatrix} A$$

$$R_1 \rightarrow R_1 + R_3/2 \quad \& \quad R_2 \rightarrow R_2 - 5R_3/2$$

$$\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix} = \begin{bmatrix} 3 & -1 & 1 \\ -15 & 6 & -5 \\ 5 & -2 & 2 \end{bmatrix} A$$

$$\therefore A^{-1} = \begin{bmatrix} 3 & -1 & 1 \\ -15 & 6 & -5 \\ 5 & -2 & 2 \end{bmatrix}$$

$$2(iii) \begin{bmatrix} 2 & 1 & -1 \\ 0 & 2 & 1 \\ 5 & 2 & -3 \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix} A$$

$$R_1 \leftrightarrow R_3$$

$$\begin{bmatrix} 5 & 2 & -3 \\ 0 & 2 & 1 \\ 2 & 1 & -1 \end{bmatrix} = \begin{bmatrix} 0 & 0 & 1 \\ 0 & 1 & 0 \\ 1 & 0 & 0 \end{bmatrix} A$$

$$R_1 \rightarrow R_1 - 2R_3$$

$$\begin{bmatrix} 1 & 0 & -1 \\ 0 & 2 & 1 \\ 2 & 1 & -1 \end{bmatrix} = \begin{bmatrix} -2 & 0 & 1 \\ 0 & 1 & 0 \\ 1 & 0 & 0 \end{bmatrix} A$$

$$R_3 \rightarrow R_3 - 2R_1$$

$$\begin{bmatrix} 1 & 0 & -1 \\ 0 & 2 & 1 \\ 0 & 1 & 1 \end{bmatrix} = \begin{bmatrix} -2 & 0 & 1 \\ 0 & 1 & 0 \\ 5 & 0 & -2 \end{bmatrix} A$$

$$R_2 \rightarrow R_2 - R_3$$

$$\begin{bmatrix} 1 & 0 & -1 \\ 0 & 1 & 0 \\ 0 & 1 & 1 \end{bmatrix} = \begin{bmatrix} -2 & 0 & 1 \\ -5 & 1 & 2 \\ 5 & 0 & -2 \end{bmatrix} A$$

$$R_3 \rightarrow R_3 - R_2$$

$$\begin{bmatrix} 1 & 0 & -1 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix} = \begin{bmatrix} -2 & 0 & 1 \\ -5 & 1 & 2 \\ 10 & -1 & -4 \end{bmatrix} A$$

$$R_1 \rightarrow R_1 + R_3$$

$$\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix} = \begin{bmatrix} 8 & -1 & -3 \\ -5 & 1 & 2 \\ 10 & -1 & -4 \end{bmatrix} A$$

$$A^{-1} = \begin{bmatrix} 8 & -1 & -3 \\ -5 & 1 & 2 \\ 10 & -1 & -4 \end{bmatrix}$$



Q. 3 Find inverse by elementary row transformation.

$$(i) \begin{bmatrix} 1 & 1 & 3 \\ 1 & 3 & -3 \\ -2 & -4 & -4 \end{bmatrix}$$

$$(ii) \begin{bmatrix} 3 & -3 & 4 \\ 2 & -3 & 4 \\ 0 & -1 & 1 \end{bmatrix}$$

$$(iii) \begin{bmatrix} 1 & 2 & 5 \\ 2 & 3 & 1 \\ -1 & 1 & 1 \end{bmatrix}$$

$$3(i) R_2 \rightarrow R_2 - R_1 \text{ \& } R_3 \rightarrow R_3 + 2R_1$$

$$\begin{bmatrix} 1 & 1 & 3 \\ 0 & 2 & -6 \\ 0 & -2 & 2 \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 \\ -1 & 1 & 0 \\ 2 & 0 & 1 \end{bmatrix} A$$

$$R_2 \rightarrow R_2/2$$

$$\begin{bmatrix} 1 & 1 & 3 \\ 0 & 1 & -3 \\ 0 & -2 & 2 \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 \\ -1/2 & 1/2 & 0 \\ 2 & 0 & 1 \end{bmatrix} A$$

$$R_1 \rightarrow R_1 - R_2 \text{ \& } R_3 \rightarrow R_3 + 2R_2$$

$$\begin{bmatrix} 1 & 0 & 6 \\ 0 & 1 & -3 \\ 0 & 0 & -4 \end{bmatrix} = \begin{bmatrix} 3/2 & -1/2 & 0 \\ -1/2 & 1/2 & 0 \\ 1 & 1 & 1 \end{bmatrix} A$$

$$R_3 \rightarrow -R_3/4$$

$$\begin{bmatrix} 1 & 0 & 6 \\ 0 & 1 & -3 \\ 0 & 0 & 1 \end{bmatrix} = \begin{bmatrix} 3/2 & -1/2 & 0 \\ -1/2 & 1/2 & 0 \\ -1/4 & -1/4 & -1/4 \end{bmatrix} A$$

$$R_1 \rightarrow R_1 - 6R_3 \text{ \& } R_2 \rightarrow R_2 + 3R_3$$

$$\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix} = \begin{bmatrix} 3 & 1 & 3/2 \\ -1 & 1/4 & 3/4 \\ -1/4 & -1/4 & -1/4 \end{bmatrix} A$$

$$\therefore A^{-1} = \begin{bmatrix} 3 & 1 & 3/2 \\ -1 & 1/4 & 3/4 \\ -1/4 & -1/4 & -1/4 \end{bmatrix}$$

$$3(ii) \begin{bmatrix} 3 & -3 & 4 \\ 2 & -3 & 4 \\ 0 & -1 & 1 \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix} A$$

$$R_1 \rightarrow R_1 - R_2$$

$$\begin{bmatrix} 1 & 0 & 0 \\ 2 & -3 & 4 \\ 0 & -1 & 1 \end{bmatrix} = \begin{bmatrix} 1 & -1 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix} A$$

$$R_2 \rightarrow R_2 - 2R_1$$

$$\begin{bmatrix} 1 & 0 & 0 \\ 0 & -3 & 4 \\ 0 & -1 & 1 \end{bmatrix} = \begin{bmatrix} 1 & -1 & 0 \\ 2 & 3 & 0 \\ 0 & 0 & 1 \end{bmatrix} A$$

$$R_3 \rightarrow 3R_3 - R_2 \text{ and } R_2 \rightarrow R_2 + 4R_3$$

$$\begin{bmatrix} 1 & 0 & 0 \\ 0 & -3 & 0 \\ 0 & 0 & -1 \end{bmatrix} = \begin{bmatrix} 1 & -1 & 0 \\ 6 & -9 & 12 \\ 2 & -3 & 3 \end{bmatrix} A$$

$$R_2 \rightarrow -R_2/3$$

$$\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix} = \begin{bmatrix} 1 & -1 & 0 \\ -2 & 3 & -4 \\ -2 & 3 & -3 \end{bmatrix} A$$

$$\therefore A^{-1} = \begin{bmatrix} 1 & -1 & 0 \\ -2 & 3 & -4 \\ -2 & 3 & -3 \end{bmatrix}$$



Ques 4 Find rank of matrices.

$$4(i) \begin{bmatrix} 2 & -1 & 0 & 5 \\ 0 & 3 & 1 & 4 \end{bmatrix}_{2 \times 4}$$

$$\begin{vmatrix} 2 & -1 \\ 0 & 3 \end{vmatrix} = 6 \neq 0$$

$$\therefore \rho(A) = 2$$

$$4(ii) \begin{bmatrix} 1 & 2 & 3 \\ 2 & 4 & 7 \\ 3 & 6 & 10 \end{bmatrix}_{3 \times 3} = A$$

$$|A| = 0$$

$$\begin{vmatrix} 1 & 2 \\ 2 & 4 \end{vmatrix} = 0 \quad \begin{vmatrix} 2 & 3 \\ 4 & 7 \end{vmatrix} = 2 \neq 0$$

$$\therefore \rho(A) = 2.$$

$$4(iii) \begin{bmatrix} 1 & 3 & 4 & 5 \\ 1 & 2 & 6 & 7 \\ 1 & 5 & 0 & 10 \end{bmatrix}_{3 \times 4}$$

$$\begin{vmatrix} 1 & 3 & 4 \\ 1 & 2 & 6 \\ 1 & 5 & 0 \end{vmatrix} = 0 \quad \begin{vmatrix} 3 & 4 & 5 \\ 2 & 6 & 7 \\ 5 & 0 & 10 \end{vmatrix} \neq 0 \therefore \rho(A) = 3$$

$$4(iv) \begin{bmatrix} 1 & 3 & 4 & 3 \\ 3 & 9 & 12 & 3 \\ 1 & 3 & 4 & 1 \end{bmatrix} \Rightarrow \begin{vmatrix} 1 & 3 & 4 \\ 3 & 9 & 12 \\ 1 & 3 & 4 \end{vmatrix} = 0$$

$$\begin{vmatrix} 3 & 4 & 3 \\ 9 & 12 & 3 \\ 3 & 4 & 1 \end{vmatrix} = 0 \quad \begin{vmatrix} 1 & 3 & 3 \\ 3 & 9 & 3 \\ 1 & 3 & 1 \end{vmatrix} = 0 \quad \begin{vmatrix} 1 & 4 & 3 \\ 3 & 12 & 3 \\ 1 & 4 & 1 \end{vmatrix} = 0$$

$$\begin{vmatrix} 1 & 3 \\ 3 & 9 \end{vmatrix} = 0 \quad \begin{vmatrix} 3 & 4 \\ 9 & 12 \end{vmatrix} = 0 \quad \begin{vmatrix} 4 & 3 \\ 12 & 3 \end{vmatrix} \neq 0 \therefore \rho(A) = 2$$

$$4(v) \begin{bmatrix} 1 & 4 & 5 \\ 2 & 6 & 8 \\ 3 & 7 & 22 \end{bmatrix}_{3 \times 3} = A$$

$$\therefore |A| = 21 \neq 0 \therefore \rho(A) = 3.$$

$$4(vi) \begin{bmatrix} 2 & -4 & 6 \\ -1 & 2 & -3 \\ 3 & -6 & 9 \end{bmatrix}_{3 \times 3} = A \quad |A| = 0 \quad \begin{vmatrix} 2 & -4 \\ -1 & 2 \end{vmatrix} = 0 \quad \begin{vmatrix} -4 & 6 \\ 2 & -3 \end{vmatrix} = 0$$

$$\begin{vmatrix} 2 & 6 \\ -1 & -3 \end{vmatrix} = 0 \quad \begin{vmatrix} -1 & 2 \\ 3 & -6 \end{vmatrix} = 0 \quad \begin{vmatrix} 2 & -3 \\ -6 & 9 \end{vmatrix} = 0 \quad \begin{vmatrix} -1 & -3 \\ 3 & 9 \end{vmatrix} = 0$$

$$\therefore \rho(A) = 1$$

Reducing in normal form.



$$5(ii) \begin{bmatrix} 6 & 1 & 3 & 8 \\ 4 & 2 & 6 & -1 \\ 10 & 3 & 9 & 7 \\ 16 & 4 & 12 & 15 \end{bmatrix}$$

$$R_1 \rightarrow R_1/6$$

$$\begin{bmatrix} 1 & 1/6 & 1/2 & 4/3 \\ 4 & 2 & 6 & -1 \\ 10 & 3 & 9 & 7 \\ 16 & 4 & 12 & 15 \end{bmatrix}$$

$$R_2 \rightarrow R_2 - 4R_1$$

$$R_3 \rightarrow R_3 - 10R_1$$

$$R_4 \rightarrow R_4 - 16R_1$$

$$\begin{bmatrix} 1 & 1/6 & 1/2 & 4/3 \\ 0 & 4/3 & 4 & -19/3 \\ 0 & 4/3 & 4 & -19/3 \\ 0 & 4/3 & 4 & -19/3 \end{bmatrix}$$

$$R_2 \rightarrow 3R_2/4$$

$$R_3 \rightarrow R_3 - R_2$$

$$\begin{bmatrix} 1 & 1/6 & 1/2 & 4/3 \\ 0 & 1 & 3 & -19/4 \\ 0 & 0 & 0 & 0 \\ 0 & 4/3 & 4 & -19/3 \end{bmatrix}$$

$$R_3 \leftrightarrow R_4$$

$$\begin{bmatrix} 1 & 1/6 & 1/2 & 4/3 \\ 0 & 1 & 3 & -19/4 \\ 0 & 4/3 & 4 & -19/3 \\ 0 & 0 & 0 & 0 \end{bmatrix}$$

$$R_3 \rightarrow R_3 - 4R_2/3$$

$$\begin{bmatrix} 1 & 1/6 & 1/2 & 4/3 \\ 0 & 1 & 3 & -19/4 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \end{bmatrix}$$

$$C_2 \rightarrow C_2 - C_1/6$$

$$C_3 \rightarrow C_3 - C_1/2$$

$$\begin{bmatrix} 1 & 0 & 0 & 4/3 \\ 0 & 1 & 5/2 & -19/4 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \end{bmatrix}$$

$$C_3 \rightarrow C_3 - 5C_1/2$$

$$C_4 \rightarrow C_4 - 4C_1/3$$

$$\begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & -19/4 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \end{bmatrix}$$

$$C_4 \rightarrow C_4 + 19C_1/4$$

$$\begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \end{bmatrix}$$

$$\rightarrow \begin{bmatrix} I_2 & 0 \\ 0 & 0 \end{bmatrix}$$

$$\therefore \rho(A) = 2$$



$$6(iii) \begin{bmatrix} 1 & -1 & 2 & -3 \\ 4 & 1 & 0 & 2 \\ 0 & 3 & 1 & 4 \\ 0 & 1 & 0 & 2 \end{bmatrix}$$

$$R_2 \leftrightarrow R_4$$

$$\begin{bmatrix} 1 & -1 & 2 & -3 \\ 0 & 1 & 0 & 2 \\ 0 & 3 & 1 & 4 \\ 4 & 1 & 0 & 2 \end{bmatrix}$$

$$R_1 \rightarrow R_1 + R_2$$

$$\begin{bmatrix} 1 & 0 & 2 & -1 \\ 0 & 1 & 0 & 2 \\ 0 & 3 & 1 & 4 \\ 4 & 1 & 0 & 2 \end{bmatrix}$$

$$R_3 \rightarrow R_3 - R_2$$

$$\begin{bmatrix} 1 & 0 & 2 & -1 \\ 0 & 1 & 0 & 2 \\ 0 & 2 & 1 & 2 \\ 4 & 1 & 0 & 2 \end{bmatrix}$$

$$R_4 \rightarrow R_4 - R_2$$

$$\begin{bmatrix} 1 & 0 & 2 & -1 \\ 0 & 1 & 0 & 2 \\ 0 & 1 & 1 & 0 \\ 4 & 0 & 0 & 0 \end{bmatrix}$$

$$R_4 \rightarrow R_4/4, R_1 \rightarrow R_1 - R_4$$

$$\begin{bmatrix} 0 & 0 & 2 & -1 \\ 0 & 1 & 0 & 2 \\ 0 & 1 & 1 & 0 \\ 1 & 0 & 0 & 0 \end{bmatrix}$$

$$R_1 \leftrightarrow R_4, R_3 \rightarrow R_3 - R_2$$

$$\begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 2 \\ 0 & 0 & 1 & -2 \\ 0 & 0 & 2 & -1 \end{bmatrix}$$

$$R_4 \rightarrow R_4 - 2R_3$$

$$\begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 2 \\ 0 & 0 & 1 & -2 \\ 0 & 0 & 0 & 3 \end{bmatrix}$$

$$R_4 \rightarrow R_4/3 \text{ \& } R_2 \rightarrow R_2 - 2R_4, R_3 \rightarrow R_3 + 2R_4$$

$$\begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix} \rightarrow [I_4]$$

$$\therefore \rho(A) = 4$$

$$6(iv) \begin{bmatrix} 0 & 1 & -3 & -1 \\ 1 & 0 & 1 & 1 \\ 3 & 1 & 0 & 2 \\ 1 & 1 & -2 & 0 \end{bmatrix}$$

$$R_1 \leftrightarrow R_2$$

$$\begin{bmatrix} 1 & 0 & 1 & 1 \\ 0 & 1 & -3 & -1 \\ 3 & 1 & 0 & 2 \\ 1 & 1 & -2 & 0 \end{bmatrix}$$

$$R_3 \rightarrow R_3 - R_1$$

$$\begin{bmatrix} 1 & 0 & 1 & 1 \\ 0 & 1 & -3 & -1 \\ 2 & 1 & -1 & 1 \\ 1 & 1 & -2 & 0 \end{bmatrix}$$

$$R_3 \rightarrow R_3 - R_4$$

$$\begin{bmatrix} 1 & 0 & 1 & 1 \\ 0 & 1 & -3 & -1 \\ 1 & 0 & 1 & 1 \\ 1 & 1 & -2 & 0 \end{bmatrix}$$

$$R_4 \rightarrow R_4 - R_3$$

$$\begin{bmatrix} 1 & 0 & 1 & 1 \\ 0 & 1 & -3 & -1 \\ 1 & 0 & 1 & 1 \\ 0 & 1 & -3 & -1 \end{bmatrix}$$

$$R_4 \rightarrow R_4 - R_2$$

$$\begin{bmatrix} 1 & 0 & 1 & 1 \\ 0 & 1 & -3 & -1 \\ 1 & 0 & 1 & 1 \\ 0 & 0 & 0 & 0 \end{bmatrix}$$

$$R_3 \rightarrow R_3 - R_1$$

$$\begin{bmatrix} 1 & 0 & 1 & 1 \\ 0 & 1 & -3 & -1 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \end{bmatrix}$$

$$\therefore \rho(A) = 2$$



$$6(vi) \begin{bmatrix} 1^2 & 2^2 & 3^2 & 4^2 \\ 2^2 & 3^2 & 4^2 & 5^2 \\ 3^2 & 4^2 & 5^2 & 6^2 \\ 4^2 & 5^2 & 6^2 & 7^2 \end{bmatrix}$$

$$\begin{bmatrix} 1 & 4 & 9 & 16 \\ 4 & 9 & 16 & 25 \\ 9 & 16 & 25 & 36 \\ 16 & 25 & 36 & 49 \end{bmatrix}$$

$$R_2 \rightarrow R_2 - 4R_1$$

$$R_3 \rightarrow R_3 - 9R_1$$

$$\begin{bmatrix} 1 & 4 & 9 & 16 \\ 0 & -7 & -20 & -39 \\ 0 & -20 & -56 & -108 \\ 7 & 25 & 36 & 49 \end{bmatrix}$$

$$R_4 \rightarrow R_4 - 16R_1$$

$$R_2 \rightarrow -R_2/7$$

$$\begin{bmatrix} 1 & 4 & 9 & 16 \\ 0 & 1 & 20/7 & 39/7 \\ 0 & -20 & -56 & -108 \\ 0 & -39 & -108 & -207 \end{bmatrix}$$

$$R_3 \rightarrow R_3 + 20R_2$$

$$R_4 \rightarrow R_4 + 39R_2$$

$$\begin{bmatrix} 1 & 4 & 9 & 16 \\ 0 & 1 & 20/7 & 39/7 \\ 0 & 0 & 8/7 & 24/7 \\ 0 & 0 & 24/7 & 72/7 \end{bmatrix}$$

$$R_3 \rightarrow 7R_3/8$$

$$\begin{bmatrix} 1 & 4 & 9 & 16 \\ 0 & 1 & 20/7 & 39/7 \\ 0 & 0 & 1 & 3 \\ 0 & 0 & 24/7 & 72/7 \end{bmatrix}$$

$$R_4 \rightarrow R_4 - 24R_3/7$$

$$\begin{bmatrix} 1 & 4 & 9 & 16 \\ 0 & 1 & 20/7 & 39/7 \\ 0 & 0 & 1 & 3 \\ 0 & 0 & 0 & 0 \end{bmatrix}$$

$$\rho(A) = 3$$



$$7(ii) \begin{bmatrix} -1 & 2 & 3 & -2 \\ 2 & -5 & 1 & 2 \\ 3 & -8 & 5 & 2 \\ 5 & -12 & -1 & 6 \end{bmatrix}$$

$$R_1 \rightarrow -R_1$$

$$\begin{bmatrix} 1 & -2 & -3 & 2 \\ 2 & -5 & 1 & 2 \\ 3 & -8 & 5 & 2 \\ 5 & -12 & -1 & 6 \end{bmatrix}$$

$$R_2 \rightarrow R_2 - 2R_1$$

$$R_3 \rightarrow R_3 - 3R_1$$

$$R_4 \rightarrow R_4 - 5R_1$$

$$\begin{bmatrix} 1 & -2 & -3 & 2 \\ 0 & -1 & 7 & -2 \\ 0 & -2 & 14 & -4 \\ 0 & -2 & 14 & -4 \end{bmatrix}$$

$$R_2 \rightarrow -R_2$$

$$R_3 \rightarrow R_3 - R_4$$

$$\begin{bmatrix} 1 & -2 & -3 & 2 \\ 0 & 1 & -7 & 2 \\ 0 & 0 & 0 & 0 \\ 0 & -2 & 14 & -4 \end{bmatrix}$$

$$R_4 \rightarrow R_4 + 2R_2$$

$$\begin{bmatrix} 1 & -2 & -3 & 2 \\ 0 & 1 & -7 & 2 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \end{bmatrix}$$

Two no zero rows.

$$\therefore \rho(A) = 2$$



$$7(iv) \begin{bmatrix} 1 & 2 & 3 & 4 \\ 2 & 3 & 4 & 5 \\ 3 & 4 & 5 & 6 \\ 4 & 5 & 6 & 7 \end{bmatrix}$$

$$R_4 \rightarrow R_4 - R_3$$

$$\begin{bmatrix} 1 & 2 & 3 & 4 \\ 2 & 3 & 4 & 5 \\ 3 & 4 & 5 & 6 \\ 1 & 1 & 1 & 1 \end{bmatrix}$$

$$R_3 \rightarrow R_3 - R_4$$

$$\begin{bmatrix} 1 & 2 & 3 & 4 \\ 2 & 3 & 4 & 5 \\ 2 & 3 & 4 & 5 \\ 1 & 1 & 1 & 1 \end{bmatrix}$$

$$R_3 \rightarrow R_3 - R_2$$

$$\begin{bmatrix} 1 & 2 & 3 & 4 \\ 2 & 3 & 4 & 5 \\ 0 & 0 & 0 & 0 \\ 1 & 1 & 1 & 1 \end{bmatrix}$$

$$R_2 \rightarrow R_2 - R_1$$

$$\begin{bmatrix} 1 & 2 & 3 & 4 \\ 1 & 2 & 3 & 4 \\ 0 & 0 & 0 & 0 \\ 1 & 1 & 1 & 1 \end{bmatrix}$$

$$R_2 \rightarrow R_2 - R_1$$

$$\begin{bmatrix} 1 & 2 & 3 & 4 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \\ 1 & 1 & 1 & 1 \end{bmatrix}$$

$$R_1 \rightarrow R_1 - R_4$$

$$\begin{bmatrix} 0 & 1 & 2 & 3 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \\ 1 & 1 & 1 & 1 \end{bmatrix}$$

$$R_2 \leftrightarrow R_4$$

$$\begin{bmatrix} 0 & 1 & 2 & 3 \\ 1 & 1 & 1 & 1 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \end{bmatrix}$$

$$R_1 \leftrightarrow R_2$$

$$\begin{bmatrix} 1 & 1 & 1 & 1 \\ 0 & 1 & 2 & 3 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \end{bmatrix}$$

Two non-zero rows.

$$\therefore \rho(A) = 2$$



$$8(ii) \begin{bmatrix} 1 & 2 & 0 & -1 \\ 3 & 4 & 1 & 2 \\ -2 & 3 & 2 & 5 \end{bmatrix}$$

$$R_2 \rightarrow R_2 - 3R_1$$

$$\begin{bmatrix} 1 & 2 & 0 & -1 \\ 0 & -2 & 1 & 5 \\ -2 & 3 & 2 & 5 \end{bmatrix}$$

$$R_3 \rightarrow R_3 + 2R_1$$

$$\begin{bmatrix} 1 & 2 & 0 & -1 \\ 0 & -2 & 1 & 5 \\ 0 & 5 & 2 & 4 \end{bmatrix}$$

$$C_2 \rightarrow C_2 + C_3$$

$$\begin{bmatrix} 1 & 2 & 0 & -1 \\ 0 & -1 & 1 & 5 \\ 0 & 7 & 2 & 4 \end{bmatrix}$$

$$C_2 \leftrightarrow C_3$$

$$\begin{bmatrix} 1 & 0 & 2 & -1 \\ 0 & 1 & -1 & 5 \\ 0 & 2 & 7 & 4 \end{bmatrix}$$

$$R_3 \rightarrow R_3 - 2R_2$$

$$\begin{bmatrix} 1 & 0 & 2 & -1 \\ 0 & 1 & -1 & 5 \\ 0 & 0 & 9 & -6 \end{bmatrix}$$

$$R_4 \rightarrow R_4/3$$

$$\begin{bmatrix} 1 & 0 & 2 & -1 \\ 0 & 1 & -1 & 5 \\ 0 & 0 & 3 & -2 \end{bmatrix}$$

$$R_1 \rightarrow R_1 - R_3$$

$$\begin{bmatrix} 1 & 0 & -1 & 1 \\ 0 & 1 & -1 & 5 \\ 0 & 0 & 3 & -2 \end{bmatrix}$$

$$C_3 \rightarrow C_3 + C_4$$

$$\begin{bmatrix} 1 & 0 & 0 & 1 \\ 0 & 1 & -1 & 5 \\ 0 & 0 & 3 & -2 \end{bmatrix}$$

$$C_3 \rightarrow C_3 + C_2$$

$$\begin{bmatrix} 1 & 0 & 0 & 1 \\ 0 & 1 & 0 & 5 \\ 0 & 0 & 3 & -2 \end{bmatrix}$$

$$C_4 \rightarrow C_4 - C_3$$

$$\begin{bmatrix} 1 & 0 & 0 & 1 \\ 0 & 1 & 0 & 5 \\ 0 & 0 & 3 & -5 \end{bmatrix}$$

$$C_4 \rightarrow C_4 - C_1$$

$$\begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 5 \\ 0 & 0 & 3 & -5 \end{bmatrix}$$

$$C_4 \rightarrow C_4 - 5C_2$$

$$\begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 3 & -5 \end{bmatrix}$$

$$C_4 \rightarrow -C_4/5$$

$$\begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 3 & 1 \end{bmatrix}$$

$$C_3 \rightarrow C_3/3$$

$$\begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 1 \end{bmatrix}$$

$$C_4 \rightarrow C_4 - C_3$$

$$\begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \end{bmatrix}$$

$$\Rightarrow [I_3 \ 0]$$

$$\therefore \rho(A) = 3$$



| Subject Code                              | Subject Name | Exam Type | Maximum Marks | Student Batch | Student Semester | Student Class | Student Roll No | Student Name        | 40.00 | Obtained | Row Total |
|-------------------------------------------|--------------|-----------|---------------|---------------|------------------|---------------|-----------------|---------------------|-------|----------|-----------|
| B.Tech-CSE (Computer Science Engineering) |              |           |               |               | CLASS - 3 - 4    |               | 230BTCCSE157    | HARSHITA KAKKAR     |       | 0        | 0         |
|                                           |              |           |               |               |                  |               | 240BTCCSE003    | Drishika Aneja      |       | 35.50    | 35.50     |
|                                           |              |           |               |               |                  |               | 240BTCCSE007    | Akshat Shukla       |       | 30.00    | 30.00     |
|                                           |              |           |               |               |                  |               | 240BTCCSE008    | Astik Gupta         |       | 34.00    | 34.00     |
|                                           |              |           |               |               |                  |               | 240BTCCSE009    | Ayesha Gupta        |       | 37.50    | 37.50     |
|                                           |              |           |               |               |                  |               | 240BTCCSE016    | Aryan Napit         |       | 32.50    | 32.50     |
|                                           |              |           |               |               |                  |               | 240BTCCSE019    | Aaditya Jha         |       | 0        | 0         |
|                                           |              |           |               |               |                  |               | 240BTCCSE020    | Aashi Thakran       |       | 27.00    | 27.00     |
|                                           |              |           |               |               |                  |               | 240BTCCSE022    | Dhruv Yadav         |       | 21.50    | 21.50     |
|                                           |              |           |               |               |                  |               | 240BTCCSE023    | Arpit Kumar         |       | 27.00    | 27.00     |
|                                           |              |           |               |               |                  |               | 240BTCCSE029    | Aarti Negi          |       | 36.00    | 36.00     |
|                                           |              |           |               |               |                  |               | 240BTCCSE032    | Arkish Dahiya       |       | 28.50    | 28.50     |
|                                           |              |           |               |               |                  |               | 240BTCCSE038    | Bhavik Shankar      |       | 28.50    | 28.50     |
|                                           |              |           |               |               |                  |               | 240BTCCSE041    | Bhavik Chawla       |       | 27.00    | 27.00     |
|                                           |              |           |               |               |                  |               | 240BTCCSE043    | Arav                |       | 28.00    | 28.00     |
|                                           |              |           |               |               |                  |               | 240BTCCSE047    | Ashish Kumar Sharma |       | 32.50    | 32.50     |
|                                           |              |           |               |               |                  |               | 240BTCCSE059    | Atharv Malik        |       | 28.00    | 28.00     |
|                                           |              |           |               |               |                  |               | 240BTCCSE062    | Arman Saifi         |       | 34.50    | 34.50     |
|                                           |              |           |               |               |                  |               | 240BTCCSE063    | Aryan Kumar         |       | 35.00    | 35.00     |
|                                           |              |           |               |               |                  |               | 240BTCCSE065    | Harsh Sharma        |       | 29.00    | 29.00     |
|                                           |              |           |               |               |                  |               | 240BTCCSE077    | Anupriya            |       | 37.00    | 37.00     |
|                                           |              |           |               |               |                  |               | 240BTCCSE081    | Ankit Nagar         |       | 20.00    | 20.00     |
|                                           |              |           |               |               |                  |               | 240BTCCSE087    | Abhinav Ranga       |       | 28.00    | 28.00     |
|                                           |              |           |               |               |                  |               | 240BTCCSE091    | Aditya chaudhary    |       | 18.00    | 18.00     |
|                                           |              |           |               |               |                  |               | 240BTCCSE106    | Dishant             |       | 20.00    | 20.00     |
|                                           |              |           |               |               |                  |               | 240BTCCSE107    | Rahul sehwat        |       | 26.00    | 26.00     |
|                                           |              |           |               |               |                  |               | 240BTCCSE108    | Dhruv Yadav         |       | 31.50    | 31.50     |
|                                           |              |           |               |               |                  |               | 240BTCCSE109    | Deepak Phogat       |       | 22.00    | 22.00     |
|                                           |              |           |               |               |                  |               | 240BTCCSE115    | Anuj Kumar          |       | 31.50    | 31.50     |
|                                           |              |           |               |               |                  |               | 240BTCCSE012    | Mayank Kaushik      |       | 33.50    | 33.50     |

Manning



|           |              |                      |       |       |
|-----------|--------------|----------------------|-------|-------|
| CLASS - 1 | 240BTCCSE013 | Kanishk Gaur         | 32.00 | 32.00 |
|           | 240BTCCSE017 | Jayant Gaur          | 24.00 | 24.00 |
|           | 240BTCCSE018 | Harshit Kumar Pandey | 38.50 | 38.50 |
|           | 240BTCCSE026 | Harshit Chhillar     | 27.00 | 27.00 |
|           | 240BTCCSE030 | Himanshu Kumar Cha   | 32.50 | 32.50 |
|           | 240BTCCSE037 | Kanishka Srivastava  | 30.00 | 30.00 |
|           | 240BTCCSE042 | Kanishka Yadav       | 32.00 | 32.00 |
|           | 240BTCCSE044 | Faizan Khan          | 25.50 | 25.50 |
|           | 240BTCCSE046 | Kyathika Rao Seelam  | 38.50 | 38.50 |
|           | 240BTCCSE050 | Kunal Joon           | 35.50 | 35.50 |
|           | 240BTCCSE051 | Mayank Rathore       | 20.00 | 20.00 |
|           | 240BTCCSE056 | Sarthak Panday       | 26.50 | 26.50 |
|           | 240BTCCSE069 | Krishna Gemini       | 29.50 | 29.50 |
|           | 240BTCCSE070 | Mayank Sharma        | 33.50 | 33.50 |
|           | 240BTCCSE071 | Pragya               | 22.50 | 22.50 |
|           | 240BTCCSE074 | Sanjeev Kumar        | 29.50 | 29.50 |
|           | 240BTCCSE076 | Poorav Yadav         | 26.50 | 26.50 |
|           | 240BTCCSE078 | Kaushal Yadav        | 32.50 | 32.50 |
|           | 240BTCCSE079 | Akshit Mathur        | 29.50 | 29.50 |
|           | 240BTCCSE083 | Vipin Singh Yadav    | 22.00 | 22.00 |
|           | 240BTCCSE084 | Shiv Kumar Ray       | 31.50 | 31.50 |
|           | 240BTCCSE089 | Jatin Rana           | 24.50 | 24.50 |
|           | 240BTCCSE090 | Kritish Sharma       | 36.00 | 36.00 |
|           | 240BTCCSE001 | Nihal Pandey         | 28.50 | 28.50 |
|           | 240BTCCSE002 | Rossane Henrick      | 28.00 | 28.00 |
|           | 240BTCCSE004 | Prince Bhardwaj      | 34.00 | 34.00 |
|           | 240BTCCSE005 | Piyush Choubey       | 30.50 | 30.50 |
|           | 240BTCCSE006 | Saara Tewathia       | 36.00 | 36.00 |
|           | 240BTCCSE014 | Mohit Naharwa        | 23.00 | 23.00 |
|           | 240BTCCSE021 | Nikhil Patel         | 36.50 | 36.50 |
|           | 240BTCCSE024 | Palak Shrivastav     | 27.00 | 27.00 |
|           | 240BTCCSE025 | Naresh Kumar         | 25.50 | 25.50 |
|           | 240BTCCSE028 | Prashant Sharma      | 30.50 | 30.50 |
|           | 240BTCCSE036 | Jai Kumar Jha        | 21.50 | 21.50 |
|           | 240BTCCSE045 | Nitin Sehrawat       |       | 0     |



CLASS - 1

|              |                       |       |       |
|--------------|-----------------------|-------|-------|
| 240BTCCSE048 | Parineeta             | 25.50 | 25.50 |
| 240BTCCSE052 | Ritesh Maan           | 32.50 | 32.50 |
| 240BTCCSE057 | Divyanshu Rana        | 31.00 | 31.00 |
| 240BTCCSE060 | Ritesh Kumar          | 28.50 | 28.50 |
| 240BTCCSE068 | Yashraj Kaushik       |       | 0     |
| 240BTCCSE085 | Mohd Hamza            | 28.50 | 28.50 |
| 240BTCCSE088 | Rupesh Singh          | 25.00 | 25.00 |
| 240BTCCSE093 | Sameer Vats           | 37.00 | 37.00 |
| 240BTCCSE010 | Soham Verma           | 33.00 | 33.00 |
| 240BTCCSE011 | Yuvansh Yadav         | 23.00 | 23.00 |
| 240BTCCSE015 | Taksh Roop Srivastava | 32.00 | 32.00 |
| 240BTCCSE031 | Yash Kumar            | 32.50 | 32.50 |
| 240BTCCSE033 | Aaryan Kashyap        | 22.50 | 22.50 |
| 240BTCCSE034 | Yash Yadav            | 32.00 | 32.00 |
| 240BTCCSE035 | Varsha                | 34.00 | 34.00 |
| 240BTCCSE039 | Suhani Gupta          | 37.00 | 37.00 |
| 240BTCCSE040 | Sarthak Mehta         | 26.00 | 26.00 |
| 240BTCCSE049 | Tanishka Gupta        | 34.50 | 34.50 |
| 240BTCCSE053 | Ashank Sharma         | 27.00 | 27.00 |
| 240BTCCSE054 | Avnish                | 22.00 | 22.00 |
| 240BTCCSE055 | Kumar Aryan           | 23.50 | 23.50 |
| 240BTCCSE058 | Sana Ghosh            | 26.00 | 26.00 |
| 240BTCCSE061 | Mohamoud Allaaeld     | 22.00 | 22.00 |
| 240BTCCSE064 | Mohamed khilid Khilid | 24.50 | 24.50 |
| 240BTCCSE066 | Divyansh Kaushik      | 23.00 | 23.00 |
| 240BTCCSE067 | Ummati                | 31.00 | 31.00 |
| 240BTCCSE075 | Taniya Malik          | 37.00 | 37.00 |
| 240BTCCSE080 | Deeksha Soraj         | 27.00 | 27.00 |
| 240BTCCSE086 | Sameer Pahwa          | 25.00 | 25.00 |
| 240BTCCSE092 | Sritara pasricha      | 36.50 | 36.50 |
| 240BTCCSE113 | Manan Kochar          | 34.50 | 34.50 |
| 240BTCCSE114 | Shubham Tanwar        | 28.50 | 28.50 |
| 240BTCCSE116 | RAJ ARYAN             | 28.00 | 28.00 |
| 240BTCCSE118 | Neeraj Rana           | 26.00 | 26.00 |
| 240BTCCSE119 | Lakshita              | 31.00 | 31.00 |



|                                                              |  |  |  |              |                   |       |       |
|--------------------------------------------------------------|--|--|--|--------------|-------------------|-------|-------|
| B.Tech-CSE (Computer Science Engineering) Semester CLASS - 1 |  |  |  | 240BTCCSE120 | Satvik Upadhyay   | 27.00 | 27.00 |
|                                                              |  |  |  | 240BTCCSE121 | Rishi Jaiswal     | 21.00 | 21.00 |
|                                                              |  |  |  | 240BTCCSE134 | Yash Tanwar       | 28.50 | 28.50 |
|                                                              |  |  |  | 240BTCCSE136 | payal Yadav yadav | 22.50 | 22.50 |

**SUSANT UNIVERSITY**  
**School of Engineering and Technology**

Semester : I  
 Quiz Mark : 1

Quiz Date: 20/09/2024

Program: B.Tech  
 Course Code: 23BTC-0MA117  
 Faculty Name: Dr. Manjivale  
 Question Mark: 15

| S. No. | Enrollment No. | Student Name        | Batch No | Q1(5) | Q2(5) | Q3(5) | Q4(5) | Q5(5) | Q6(5) | Q7(5) | Q8(5) | Q9(5) | Q10(5) | Q11(5) | Q12(5) | Q13(5) | Q14(5) | Q15(5) | Total Marks (15) |
|--------|----------------|---------------------|----------|-------|-------|-------|-------|-------|-------|-------|-------|-------|--------|--------|--------|--------|--------|--------|------------------|
| 1      | 24081CCSE029   | Aarti Negi          |          | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4      | 4      | 4      | 4      | 4      | 4      | 4                |
| 2      | 24081CCSE033   | Aarti Negi          |          | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4      | 4      | 4      | 4      | 4      | 4      | 4                |
| 3      | 24081CCSE020   | Aarti Negi          |          | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4      | 4      | 4      | 4      | 4      | 4      | 4                |
| 4      | 24081CCSE087   | Aarti Negi          |          | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4      | 4      | 4      | 4      | 4      | 4      | 4                |
| 5      | 24081CCSE091   | Aditya Chaudhary    |          | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4      | 4      | 4      | 4      | 4      | 4      | 4                |
| 6      | 24081CCSE007   | Akshat Shukla       |          | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4      | 4      | 4      | 4      | 4      | 4      | 4                |
| 7      | 24081CCSE079   | Akshat Shukla       |          | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4      | 4      | 4      | 4      | 4      | 4      | 4                |
| 8      | 24081CCSE081   | Akshat Shukla       |          | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4      | 4      | 4      | 4      | 4      | 4      | 4                |
| 9      | 24081CCSE115   | Arav Kumar          |          | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4      | 4      | 4      | 4      | 4      | 4      | 4                |
| 10     | 24081CCSE077   | Arav Kumar          |          | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4      | 4      | 4      | 4      | 4      | 4      | 4                |
| 11     | 24081CCSE043   | Arav Kumar          |          | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4      | 4      | 4      | 4      | 4      | 4      | 4                |
| 12     | 24081CCSE032   | Arav Kumar          |          | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4      | 4      | 4      | 4      | 4      | 4      | 4                |
| 13     | 24081CCSE062   | Arav Kumar          |          | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4      | 4      | 4      | 4      | 4      | 4      | 4                |
| 14     | 24081CCSE023   | Arav Kumar          |          | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4      | 4      | 4      | 4      | 4      | 4      | 4                |
| 15     | 24081CCSE063   | Arav Kumar          |          | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4      | 4      | 4      | 4      | 4      | 4      | 4                |
| 16     | 24081CCSE016   | Arav Kumar          |          | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4      | 4      | 4      | 4      | 4      | 4      | 4                |
| 17     | 24081CCSE053   | Arav Kumar          |          | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4      | 4      | 4      | 4      | 4      | 4      | 4                |
| 18     | 24081CCSE067   | Ashish Kumar Sharma |          | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4      | 4      | 4      | 4      | 4      | 4      | 4                |
| 19     | 24081CCSE008   | Ashish Kumar Sharma |          | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4      | 4      | 4      | 4      | 4      | 4      | 4                |
| 20     | 24081CCSE059   | Ashish Kumar Sharma |          | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4      | 4      | 4      | 4      | 4      | 4      | 4                |
| 21     | 24081CCSE054   | Ashish Kumar Sharma |          | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4      | 4      | 4      | 4      | 4      | 4      | 4                |
| 22     | 24081CCSE009   | Ashish Kumar Sharma |          | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4      | 4      | 4      | 4      | 4      | 4      | 4                |
| 23     | 24081CCSE041   | Ashish Kumar Sharma |          | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4      | 4      | 4      | 4      | 4      | 4      | 4                |
| 24     | 24081CCSE038   | Ashish Kumar Sharma |          | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4      | 4      | 4      | 4      | 4      | 4      | 4                |
| 25     | 24081CCSE080   | Ashish Kumar Sharma |          | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4      | 4      | 4      | 4      | 4      | 4      | 4                |
| 26     | 24081CCSE109   | Deepak Phogat       |          | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4      | 4      | 4      | 4      | 4      | 4      | 4                |
| 27     | 24081CCSE022   | Dhruv Yadav         |          | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4      | 4      | 4      | 4      | 4      | 4      | 4                |
| 28     | 24081CCSE108   | Dhruv Yadav         |          | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4      | 4      | 4      | 4      | 4      | 4      | 4                |
| 29     | 24081CCSE106   | Dishant             |          | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4      | 4      | 4      | 4      | 4      | 4      | 4                |
| 30     | 24081CCSE066   | Dishant             |          | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4      | 4      | 4      | 4      | 4      | 4      | 4                |
| 31     | 24081CCSE057   | Dishant             |          | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4      | 4      | 4      | 4      | 4      | 4      | 4                |
| 32     | 24081CCSE003   | Dishant             |          | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4      | 4      | 4      | 4      | 4      | 4      | 4                |
| 33     | 24081CCSE044   | Dishant             |          | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4      | 4      | 4      | 4      | 4      | 4      | 4                |
| 34     | 24081CCSE065   | Dishant             |          | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4      | 4      | 4      | 4      | 4      | 4      | 4                |
| 35     | 24081CCSE026   | Dishant             |          | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4      | 4      | 4      | 4      | 4      | 4      | 4                |
| 36     | 24081CCSE018   | Dishant             |          | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4      | 4      | 4      | 4      | 4      | 4      | 4                |
| 37     | 24081CCSE157   | Dishant             |          | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4      | 4      | 4      | 4      | 4      | 4      | 4                |
| 38     | 24081CCSE030   | Dishant             |          | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4      | 4      | 4      | 4      | 4      | 4      | 4                |
| 39     | 24081CCSE036   | Dishant             |          | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4      | 4      | 4      | 4      | 4      | 4      | 4                |
| 40     | 24081CCSE089   | Dishant             |          | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4      | 4      | 4      | 4      | 4      | 4      | 4                |
| 41     | 24081CCSE017   | Dishant             |          | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4      | 4      | 4      | 4      | 4      | 4      | 4                |
| 42     | 24081CCSE013   | Dishant             |          | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4      | 4      | 4      | 4      | 4      | 4      | 4                |
| 43     | 24081CCSE097   | Dishant             |          | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4      | 4      | 4      | 4      | 4      | 4      | 4                |
| 44     | 24081CCSE042   | Dishant             |          | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4      | 4      | 4      | 4      | 4      | 4      | 4                |
| 45     | 24081CCSE078   | Dishant             |          | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4      | 4      | 4      | 4      | 4      | 4      | 4                |
| 46     | 24081CCSE069   | Dishant             |          | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4      | 4      | 4      | 4      | 4      | 4      | 4                |
| 47     | 24081CCSE090   | Dishant             |          | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4      | 4      | 4      | 4      | 4      | 4      | 4                |
| 48     | 24081CCSE055   | Dishant             |          | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4      | 4      | 4      | 4      | 4      | 4      | 4                |
| 49     | 24081CCSE050   | Dishant             |          | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4      | 4      | 4      | 4      | 4      | 4      | 4                |
| 50     | 24081CCSE046   | Dishant             |          | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4      | 4      | 4      | 4      | 4      | 4      | 4                |
| 51     | 24081CCSE119   | Dishant             |          | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4      | 4      | 4      | 4      | 4      | 4      | 4                |
| 52     | 24081CCSE113   | Dishant             |          | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4      | 4      | 4      | 4      | 4      | 4      | 4                |
| 53     | 24081CCSE012   | Dishant             |          | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4      | 4      | 4      | 4      | 4      | 4      | 4                |
| 54     | 24081CCSE051   | Dishant             |          | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4      | 4      | 4      | 4      | 4      | 4      | 4                |
| 55     | 24081CCSE070   | Dishant             |          | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4      | 4      | 4      | 4      | 4      | 4      | 4                |
| 56     | 24081CCSE064   | Dishant             |          | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4      | 4      | 4      | 4      | 4      | 4      | 4                |
| 57     | 24081CCSE061   | Dishant             |          | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4      | 4      | 4      | 4      | 4      | 4      | 4                |
| 58     | 24081CCSE085   | Dishant             |          | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4      | 4      | 4      | 4      | 4      | 4      | 4                |
| 59     | 24081CCSE014   | Dishant             |          | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4      | 4      | 4      | 4      | 4      | 4      | 4                |
| 60     | 24081CCSE025   | Dishant             |          | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4      | 4      | 4      | 4      | 4      | 4      | 4                |
| 61     | 24081CCSE118   | Dishant             |          | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4      | 4      | 4      | 4      | 4      | 4      | 4                |
| 62     | 24081CCSE091   | Dishant             |          | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4      | 4      | 4      | 4      | 4      | 4      | 4                |
| 63     | 24081CCSE021   | Dishant             |          | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4      | 4      | 4      | 4      | 4      | 4      | 4                |
| 64     | 24081CCSE045   | Dishant             |          | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4      | 4      | 4      | 4      | 4      | 4      | 4                |
| 65     | 24081CCSE024   | Dishant             |          | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4      | 4      | 4      | 4      | 4      | 4      | 4                |
| 66     | 24081CCSE048   | Dishant             |          | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4      | 4      | 4      | 4      | 4      | 4      | 4                |
| 67     | 24081CCSE136   | Dishant             |          | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4      | 4      | 4      | 4      | 4      | 4      | 4                |
| 68     | 24081CCSE005   | Dishant             |          | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4      | 4      | 4      | 4      | 4      | 4      | 4                |
| 69     | 24081CCSE076   | Dishant             |          | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4      | 4      | 4      | 4      | 4      | 4      | 4                |
| 70     | 24081CCSE071   | Dishant             |          | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4      | 4      | 4      | 4      | 4      | 4      | 4                |
| 71     | 24081CCSE028   | Dishant             |          | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4      | 4      | 4      | 4      | 4      | 4      | 4                |
| 72     | 24081CCSE004   | Dishant             |          | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4      | 4      | 4      | 4      | 4      | 4      | 4                |
| 73     | 24081CCSE107   | Dishant             |          | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4      | 4      | 4      | 4      | 4      | 4      | 4                |
| 74     | 24081CCSE116   | Dishant             |          | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4      | 4      | 4      | 4      | 4      | 4      | 4                |
| 75     | 24081CCSE121   | Dishant             |          | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4      | 4      | 4      | 4      | 4      | 4      | 4                |
| 76     | 24081CCSE060   | Dishant             |          | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4      | 4      | 4      | 4      | 4      | 4      | 4                |
| 77     | 24081CCSE052   | Dishant             |          | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4      | 4      | 4      | 4      | 4      | 4      | 4                |
| 78     | 24081CCSE002   | Dishant             |          | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4      | 4      | 4      | 4      | 4      | 4      | 4                |
| 79     | 24081CCSE086   | Dishant             |          | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4      | 4      | 4      | 4      | 4      | 4      | 4                |
| 80     | 24081CCSE006   | Dishant             |          | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4      | 4      | 4      | 4      | 4      | 4      | 4                |
| 81     | 24081CCSE093   | Dishant             |          | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4      | 4      | 4      | 4      | 4      | 4      | 4                |
| 82     | 24081CCSE058   | Dishant             |          | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4      | 4      | 4      | 4      | 4      | 4      | 4                |
| 83     | 24081CCSE074   | Dishant             |          | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4      | 4      | 4      | 4      | 4      | 4      | 4                |
| 84     | 24081CCSE040   | Dishant             |          | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4      | 4      | 4      | 4      | 4      | 4      | 4                |
| 85     | 24081CCSE056   | Dishant             |          | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4      | 4      | 4      | 4      | 4      | 4      | 4                |
| 86     | 24081CCSE120   | Dishant             |          | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4     | 4      | 4      | 4      | 4      | 4      | 4      | 4                |

*[Handwritten Signature]*





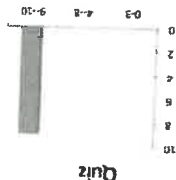
*Handwritten signature*

|     |   |
|-----|---|
| CO1 | 3 |
| CO2 | 3 |
| CO3 | 3 |

|              |                        |
|--------------|------------------------|
| Assg. Level1 | Loss than 50% students |
| Assg. Level2 | 50% to less than 60%   |
| Assg. Level3 | more than 60% students |

|      |     |     |      |
|------|-----|-----|------|
| Quiz | 0-3 | 4-6 | 7-10 |
| Ver  | 0-3 | 4-6 | 7-10 |
| Rev  | 0-3 | 4-6 | 7-10 |

| Answer | gr | Max Marks | Min Marks | Std Deviation | Less than 40% (1) | 90% (5) | More than 100.0% |
|--------|----|-----------|-----------|---------------|-------------------|---------|------------------|
| 12     |    | 14        | 5         | 1.12          | 0.00%             | 0.00%   | 100.0%           |



| Total Students Appeared in Assignment 1 (N)            |              |                       |    |   |   |   |    |    |    |
|--------------------------------------------------------|--------------|-----------------------|----|---|---|---|----|----|----|
| Number of students scored average% and above marks (P) |              |                       |    |   |   |   |    |    |    |
| CO attainment (P/N)*100                                |              |                       |    |   |   |   |    |    |    |
| 57.0%                                                  |              |                       |    |   |   |   |    |    |    |
| Total Students                                         |              |                       |    |   |   |   |    |    |    |
| Average                                                |              |                       |    |   |   |   |    |    |    |
| 11.0316317                                             |              |                       |    |   |   |   |    |    |    |
| 103                                                    | 24081CCSE011 | Yuvansh Yadav         | AB | 3 | 3 | 4 | 10 | AB | 58 |
| 102                                                    | 24081CCSE068 | Yashraj Koushik       | AB | 4 | 4 | 4 | 10 | AB | 58 |
| 101                                                    | 24081CCSE034 | Yash Yadav            | AB | 4 | 4 | 4 | 10 | AB | 58 |
| 100                                                    | 24081CCSE134 | Yash Tanwar           | AB | 4 | 4 | 4 | 10 | AB | 58 |
| 99                                                     | 24081CCSE031 | Yash Kumar            | AB | 4 | 4 | 4 | 10 | AB | 58 |
| 98                                                     | 24081CCSE083 | Vipin Singh Yadav     | AB | 4 | 4 | 4 | 10 | AB | 58 |
| 97                                                     | 24081CCSE095 | Vansha                | AB | 4 | 4 | 4 | 10 | AB | 58 |
| 96                                                     | 24081CCSE067 | Unnat                 | AB | 4 | 4 | 4 | 10 | AB | 58 |
| 95                                                     | 24081CCSE075 | Tanisha Malik         | AB | 4 | 4 | 4 | 10 | AB | 58 |
| 94                                                     | 24081CCSE049 | Tanisha Gupta         | AB | 4 | 4 | 4 | 10 | AB | 58 |
| 93                                                     | 24081CCSE015 | Tahin Hood Srivastava | AB | 4 | 4 | 4 | 10 | AB | 58 |
| 92                                                     | 24081CCSE039 | Suhani Gupta          | AB | 4 | 4 | 4 | 10 | AB | 58 |
| 91                                                     | 24081CCSE092 | Suhani Gupta          | AB | 4 | 4 | 4 | 10 | AB | 58 |
| 90                                                     | 24081CCSE010 | Soham Verma           | AB | 4 | 4 | 4 | 10 | AB | 58 |
| 89                                                     | 24081CCSE114 | Shubham Tanwar        | AB | 4 | 4 | 4 | 10 | AB | 58 |
| 88                                                     | 24081CCSE084 | Shiv Kumar Ray        | AB | 4 | 4 | 4 | 10 | AB | 58 |

# SUSHANT UNIVERSITY

## School of Engineering and Technology

Assignment (Odd Semester 2024-25)

Semester 1  
Course Name: Mathematics I  
Faculty Name: Dr. Manmala

Assignment Date: 22/11/2024

| S. No. | Rollment No. | Student Name             | Batch No | Q1(1) | Q2(2) | Q3(3) | Q4(3) | Attainment                  | Total Marks |
|--------|--------------|--------------------------|----------|-------|-------|-------|-------|-----------------------------|-------------|
| 1      | 2408TCCSE029 | Aarti Negi               | CO1      | 2     | 2     | 2     | 3     | CO1 (2.5) CO2 (2.5) CO3 (5) | 10          |
| 2      | 2408TCCSE033 | Aaryan Kashyap           | CO1      | 2     | 2     | 2     | 3     | CO1 (2.5) CO2 (2.5) CO3 (5) | 10          |
| 3      | 2408TCCSE020 | Aashi Thakran            | CO1      | 2     | 2     | 2     | 3     | CO1 (2.5) CO2 (2.5) CO3 (5) | 10          |
| 4      | 2408TCCSE087 | Abhinav Ranga            | CO1      | 2     | 2     | 2     | 3     | CO1 (2.5) CO2 (2.5) CO3 (5) | 10          |
| 5      | 2408TCCSE091 | Aditya Chaudhary         | CO1      | 2     | 2     | 2     | 3     | CO1 (2.5) CO2 (2.5) CO3 (5) | 10          |
| 6      | 2408TCCSE007 | Akshat Shukla            | CO1      | 2     | 2     | 2     | 3     | CO1 (2.5) CO2 (2.5) CO3 (5) | 10          |
| 7      | 2408TCCSE079 | Akshat Mathur            | CO1      | 2     | 2     | 2     | 3     | CO1 (2.5) CO2 (2.5) CO3 (5) | 10          |
| 8      | 2408TCCSE081 | Ankit Nagar              | CO1      | 2     | 2     | 2     | 3     | CO1 (2.5) CO2 (2.5) CO3 (5) | 10          |
| 9      | 2408TCCSE115 | Anuj Kumar               | CO1      | 2     | 2     | 2     | 3     | CO1 (2.5) CO2 (2.5) CO3 (5) | 10          |
| 10     | 2408TCCSE077 | Anupriya                 | CO1      | 2     | 2     | 2     | 3     | CO1 (2.5) CO2 (2.5) CO3 (5) | 10          |
| 11     | 2408TCCSE043 | Arav                     | CO1      | 2     | 2     | 2     | 3     | CO1 (2.5) CO2 (2.5) CO3 (5) | 10          |
| 12     | 2408TCCSE032 | Arish Dahiya             | CO1      | 2     | 2     | 2     | 3     | CO1 (2.5) CO2 (2.5) CO3 (5) | 10          |
| 13     | 2408TCCSE062 | Arman Saffi              | CO1      | 2     | 2     | 2     | 3     | CO1 (2.5) CO2 (2.5) CO3 (5) | 10          |
| 14     | 2408TCCSE023 | Arpit Kumar              | CO1      | 2     | 2     | 2     | 3     | CO1 (2.5) CO2 (2.5) CO3 (5) | 10          |
| 15     | 2408TCCSE063 | Aryan Kumar              | CO1      | 2     | 2     | 2     | 3     | CO1 (2.5) CO2 (2.5) CO3 (5) | 10          |
| 16     | 2408TCCSE053 | Aryan Nagle              | CO1      | 2     | 2     | 2     | 3     | CO1 (2.5) CO2 (2.5) CO3 (5) | 10          |
| 17     | 2408TCCSE058 | Ashank Sharma            | CO1      | 2     | 2     | 2     | 3     | CO1 (2.5) CO2 (2.5) CO3 (5) | 10          |
| 18     | 2408TCCSE047 | Ashish Kumar Sharma      | CO1      | 2     | 2     | 2     | 3     | CO1 (2.5) CO2 (2.5) CO3 (5) | 10          |
| 19     | 2408TCCSE008 | Astik Gupta              | CO1      | 2     | 2     | 2     | 3     | CO1 (2.5) CO2 (2.5) CO3 (5) | 10          |
| 20     | 2408TCCSE059 | Atharv Malik             | CO1      | 2     | 2     | 2     | 3     | CO1 (2.5) CO2 (2.5) CO3 (5) | 10          |
| 21     | 2408TCCSE054 | Ayush                    | CO1      | 2     | 2     | 2     | 3     | CO1 (2.5) CO2 (2.5) CO3 (5) | 10          |
| 22     | 2408TCCSE009 | Ayusha Gupta             | CO1      | 2     | 2     | 2     | 3     | CO1 (2.5) CO2 (2.5) CO3 (5) | 10          |
| 23     | 2408TCCSE041 | Bhavik Chawla            | CO1      | 2     | 2     | 2     | 3     | CO1 (2.5) CO2 (2.5) CO3 (5) | 10          |
| 24     | 2408TCCSE038 | Bhavik Shankar           | CO1      | 2     | 2     | 2     | 3     | CO1 (2.5) CO2 (2.5) CO3 (5) | 10          |
| 25     | 2408TCCSE080 | Deepak Sora              | CO1      | 2     | 2     | 2     | 3     | CO1 (2.5) CO2 (2.5) CO3 (5) | 10          |
| 26     | 2408TCCSE109 | Deepak Phogat            | CO1      | 2     | 2     | 2     | 3     | CO1 (2.5) CO2 (2.5) CO3 (5) | 10          |
| 27     | 2408TCCSE022 | Dhruv Yadav              | CO1      | 2     | 2     | 2     | 3     | CO1 (2.5) CO2 (2.5) CO3 (5) | 10          |
| 28     | 2408TCCSE108 | Dhruv Yadav              | CO1      | 2     | 2     | 2     | 3     | CO1 (2.5) CO2 (2.5) CO3 (5) | 10          |
| 29     | 2408TCCSE106 | Dishant                  | CO1      | 2     | 2     | 2     | 3     | CO1 (2.5) CO2 (2.5) CO3 (5) | 10          |
| 30     | 2408TCCSE066 | Divyansh Kausik          | CO1      | 2     | 2     | 2     | 3     | CO1 (2.5) CO2 (2.5) CO3 (5) | 10          |
| 31     | 2408TCCSE057 | Dnyanshu Rana            | CO1      | 2     | 2     | 2     | 3     | CO1 (2.5) CO2 (2.5) CO3 (5) | 10          |
| 32     | 2408TCCSE003 | Drishti Anja             | CO1      | 2     | 2     | 2     | 3     | CO1 (2.5) CO2 (2.5) CO3 (5) | 10          |
| 33     | 2408TCCSE044 | Faizan Khan              | CO1      | 2     | 2     | 2     | 3     | CO1 (2.5) CO2 (2.5) CO3 (5) | 10          |
| 34     | 2408TCCSE065 | Harsh Sharma             | CO1      | 2     | 2     | 2     | 3     | CO1 (2.5) CO2 (2.5) CO3 (5) | 10          |
| 35     | 2408TCCSE026 | Harshit Chhillar         | CO1      | 2     | 2     | 2     | 3     | CO1 (2.5) CO2 (2.5) CO3 (5) | 10          |
| 36     | 2408TCCSE018 | Harshit Kumar Pandey     | CO1      | 2     | 2     | 2     | 3     | CO1 (2.5) CO2 (2.5) CO3 (5) | 10          |
| 37     | 2308TCCSE157 | HARSHITA KAKKAR          | CO1      | 2     | 2     | 2     | 3     | CO1 (2.5) CO2 (2.5) CO3 (5) | 10          |
| 38     | 2408TCCSE030 | Himanshu Kumar Chaudhary | CO1      | 2     | 2     | 2     | 3     | CO1 (2.5) CO2 (2.5) CO3 (5) | 10          |
| 39     | 2408TCCSE036 | Jai Kumar Jha            | CO1      | 2     | 2     | 2     | 3     | CO1 (2.5) CO2 (2.5) CO3 (5) | 10          |
| 40     | 2408TCCSE089 | Jatin Rana               | CO1      | 2     | 2     | 2     | 3     | CO1 (2.5) CO2 (2.5) CO3 (5) | 10          |
| 41     | 2408TCCSE017 | Jayant Gaur              | CO1      | 2     | 2     | 2     | 3     | CO1 (2.5) CO2 (2.5) CO3 (5) | 10          |
| 42     | 2408TCCSE013 | Kanishk Gaur             | CO1      | 2     | 2     | 2     | 3     | CO1 (2.5) CO2 (2.5) CO3 (5) | 10          |
| 43     | 2408TCCSE037 | Kanishka Srivastava      | CO1      | 2     | 2     | 2     | 3     | CO1 (2.5) CO2 (2.5) CO3 (5) | 10          |
| 44     | 2408TCCSE042 | Kanishka Yadav           | CO1      | 2     | 2     | 2     | 3     | CO1 (2.5) CO2 (2.5) CO3 (5) | 10          |
| 45     | 2408TCCSE078 | Kaushal Yadav            | CO1      | 2     | 2     | 2     | 3     | CO1 (2.5) CO2 (2.5) CO3 (5) | 10          |
| 46     | 2408TCCSE069 | Krishna Gemini           | CO1      | 2     | 2     | 2     | 3     | CO1 (2.5) CO2 (2.5) CO3 (5) | 10          |
| 47     | 2408TCCSE090 | Krish Sharma             | CO1      | 2     | 2     | 2     | 3     | CO1 (2.5) CO2 (2.5) CO3 (5) | 10          |
| 48     | 2408TCCSE055 | Kumar Aryan              | CO1      | 2     | 2     | 2     | 3     | CO1 (2.5) CO2 (2.5) CO3 (5) | 10          |
| 49     | 2408TCCSE050 | Kunal Joon               | CO1      | 2     | 2     | 2     | 3     | CO1 (2.5) CO2 (2.5) CO3 (5) | 10          |
| 50     | 2408TCCSE046 | Kyathika Rao Seelam      | CO1      | 2     | 2     | 2     | 3     | CO1 (2.5) CO2 (2.5) CO3 (5) | 10          |
| 51     | 2408TCCSE119 | Lakshita                 | CO1      | 2     | 2     | 2     | 3     | CO1 (2.5) CO2 (2.5) CO3 (5) | 10          |
| 52     | 2408TCCSE012 | Manan Kodhar             | CO1      | 2     | 2     | 2     | 3     | CO1 (2.5) CO2 (2.5) CO3 (5) | 10          |
| 53     | 2408TCCSE017 | Mayank Kausik            | CO1      | 2     | 2     | 2     | 3     | CO1 (2.5) CO2 (2.5) CO3 (5) | 10          |
| 54     | 2408TCCSE051 | Mayank Rathore           | CO1      | 2     | 2     | 2     | 3     | CO1 (2.5) CO2 (2.5) CO3 (5) | 10          |
| 55     | 2408TCCSE070 | Mayank Sharma            | CO1      | 2     | 2     | 2     | 3     | CO1 (2.5) CO2 (2.5) CO3 (5) | 10          |
| 56     | 2408TCCSE064 | Mohamed Khilid Khilid    | CO1      | 2     | 2     | 2     | 3     | CO1 (2.5) CO2 (2.5) CO3 (5) | 10          |
| 57     | 2408TCCSE061 | Mohamoud Allahedeen      | CO1      | 2     | 2     | 2     | 3     | CO1 (2.5) CO2 (2.5) CO3 (5) | 10          |
| 58     | 2408TCCSE085 | Mohd Hamza               | CO1      | 2     | 2     | 2     | 3     | CO1 (2.5) CO2 (2.5) CO3 (5) | 10          |
| 59     | 2408TCCSE014 | Mohit Mahawra            | CO1      | 2     | 2     | 2     | 3     | CO1 (2.5) CO2 (2.5) CO3 (5) | 10          |
| 60     | 2408TCCSE025 | Naresh Kumar             | CO1      | 2     | 2     | 2     | 3     | CO1 (2.5) CO2 (2.5) CO3 (5) | 10          |
| 61     | 2408TCCSE118 | Neeraj Rana              | CO1      | 2     | 2     | 2     | 3     | CO1 (2.5) CO2 (2.5) CO3 (5) | 10          |
| 62     | 2408TCCSE001 | Nihal Pandey             | CO1      | 2     | 2     | 2     | 3     | CO1 (2.5) CO2 (2.5) CO3 (5) | 10          |
| 63     | 2408TCCSE021 | Nikhil Patel             | CO1      | 2     | 2     | 2     | 3     | CO1 (2.5) CO2 (2.5) CO3 (5) | 10          |
| 64     | 2408TCCSE045 | Nitin Sehrawat           | CO1      | 2     | 2     | 2     | 3     | CO1 (2.5) CO2 (2.5) CO3 (5) | 10          |
| 65     | 2408TCCSE024 | Palak Shrivastav         | CO1      | 2     | 2     | 2     | 3     | CO1 (2.5) CO2 (2.5) CO3 (5) | 10          |
| 66     | 2408TCCSE048 | Parineeta                | CO1      | 2     | 2     | 2     | 3     | CO1 (2.5) CO2 (2.5) CO3 (5) | 10          |
| 67     | 2408TCCSE136 | Payal Yadav Yadav        | CO1      | 2     | 2     | 2     | 3     | CO1 (2.5) CO2 (2.5) CO3 (5) | 10          |
| 68     | 2408TCCSE005 | Piyush Choubey           | CO1      | 2     | 2     | 2     | 3     | CO1 (2.5) CO2 (2.5) CO3 (5) | 10          |
| 69     | 2408TCCSE076 | Poorav Yadav             | CO1      | 2     | 2     | 2     | 3     | CO1 (2.5) CO2 (2.5) CO3 (5) | 10          |
| 70     | 2408TCCSE071 | Pragya                   | CO1      | 2     | 2     | 2     | 3     | CO1 (2.5) CO2 (2.5) CO3 (5) | 10          |
| 71     | 2408TCCSE028 | Prashant Sharma          | CO1      | 2     | 2     | 2     | 3     | CO1 (2.5) CO2 (2.5) CO3 (5) | 10          |
| 72     | 2408TCCSE004 | Prince Bhardwaj          | CO1      | 2     | 2     | 2     | 3     | CO1 (2.5) CO2 (2.5) CO3 (5) | 10          |



*Manmala*



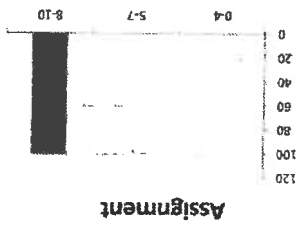
*Signature*

|                      |   |
|----------------------|---|
| CO3                  | 3 |
| CO2                  | 3 |
| CO1                  | 3 |
| COs Attainment Level | 3 |

|                              |         |         |         |
|------------------------------|---------|---------|---------|
| Assignment Attainment Levels | Level 1 | Level 2 | Level 3 |
| Level 1                      | Level 1 | Level 2 | Level 3 |
| Level 2                      | Level 2 | Level 3 | Level 4 |
| Level 3                      | Level 3 | Level 4 | Level 5 |

|                |     |     |      |
|----------------|-----|-----|------|
| Students Marks | 0-4 | 5-7 | 8-10 |
| Assignment     | 0   | 0   | 101  |

|               |       |       |       |       |       |               |
|---------------|-------|-------|-------|-------|-------|---------------|
| Average Marks | 9     | 10    | 8     | 0.85  | 0.00% | More than 90% |
| Max Marks     | 10    | 10    | 10    | 10    | 10    | 10            |
| Min Marks     | 0     | 0     | 0     | 0     | 0     | 0             |
| Std Deviation | 0.85  | 0.85  | 0.85  | 0.85  | 0.85  | 0.85          |
| Less than 40% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00%         |
| More than 90% | 76.2% | 76.2% | 76.2% | 76.2% | 76.2% | 76.2%         |



| CO attainment (P/N)*100                                |              |                       |    |   |   |   |   |   |   |
|--------------------------------------------------------|--------------|-----------------------|----|---|---|---|---|---|---|
| Number of students scored average% and above marks (P) |              |                       |    |   |   |   |   |   |   |
| Total Students Appeared in Assignment (N)              |              |                       |    |   |   |   |   |   |   |
| Average                                                |              |                       |    |   |   |   |   |   |   |
| Total Students                                         |              |                       |    |   |   |   |   |   |   |
| 103                                                    | 2408TCCSE011 | Yuvansh Yadav         | AB | 2 | 2 | 2 | 2 | 2 | 2 |
| 102                                                    | 2408TCCSE068 | Yashraj Kaushik       | AB | 2 | 2 | 2 | 2 | 2 | 2 |
| 101                                                    | 2408TCCSE034 | Yash Yadav            | AB | 2 | 2 | 2 | 2 | 2 | 2 |
| 100                                                    | 2408TCCSE134 | Yash Tanwar           | AB | 2 | 2 | 2 | 2 | 2 | 2 |
| 99                                                     | 2408TCCSE031 | Yash Kumar            | AB | 2 | 2 | 2 | 2 | 2 | 2 |
| 98                                                     | 2408TCCSE083 | Vipin Singh Yadav     | AB | 2 | 2 | 2 | 2 | 2 | 2 |
| 97                                                     | 2408TCCSE035 | Varsha                | AB | 2 | 2 | 2 | 2 | 2 | 2 |
| 96                                                     | 2408TCCSE067 | Unnati                | AB | 2 | 2 | 2 | 2 | 2 | 2 |
| 95                                                     | 2408TCCSE075 | Tanvi Malik           | AB | 2 | 2 | 2 | 2 | 2 | 2 |
| 94                                                     | 2408TCCSE049 | Tanishka Gupta        | AB | 2 | 2 | 2 | 2 | 2 | 2 |
| 93                                                     | 2408TCCSE015 | Taksh Rood Srivastava | AB | 2 | 2 | 2 | 2 | 2 | 2 |
| 92                                                     | 2408TCCSE039 | Suhani Gupta          | AB | 2 | 2 | 2 | 2 | 2 | 2 |
| 91                                                     | 2408TCCSE092 | Sritara Pasricha      | AB | 2 | 2 | 2 | 2 | 2 | 2 |
| 90                                                     | 2408TCCSE010 | Soham Verma           | AB | 2 | 2 | 2 | 2 | 2 | 2 |
| 89                                                     | 2408TCCSE114 | Shubham Tanwar        | AB | 2 | 2 | 2 | 2 | 2 | 2 |
| 88                                                     | 2408TCCSE084 | Shiv Kumar Ray        | AB | 2 | 2 | 2 | 2 | 2 | 2 |
| 87                                                     | 2408TCCSE120 | Satvik Upadhyay       | AB | 2 | 2 | 2 | 2 | 2 | 2 |
| 86                                                     | 2408TCCSE056 | Sarthak Pandey        | AB | 2 | 2 | 2 | 2 | 2 | 2 |
| 85                                                     | 2408TCCSE040 | Sarthak Mehta         | AB | 2 | 2 | 2 | 2 | 2 | 2 |
| 84                                                     | 2408TCCSE074 | Sanjeev Kumar         | AB | 2 | 2 | 2 | 2 | 2 | 2 |
| 83                                                     | 2408TCCSE058 | Sana Ghosh            | AB | 2 | 2 | 2 | 2 | 2 | 2 |
| 82                                                     | 2408TCCSE093 | Sameer Vais           | AB | 2 | 2 | 2 | 2 | 2 | 2 |
| 81                                                     | 2408TCCSE086 | Sameer Pathwa         | AB | 2 | 2 | 2 | 2 | 2 | 2 |
| 80                                                     | 2408TCCSE006 | Sara Tewathia         | AB | 2 | 2 | 2 | 2 | 2 | 2 |
| 79                                                     | 2408TCCSE088 | Rupesh Singh          | AB | 2 | 2 | 2 | 2 | 2 | 2 |
| 78                                                     | 2408TCCSE002 | Rossane Henrick       | AB | 2 | 2 | 2 | 2 | 2 | 2 |
| 77                                                     | 2408TCCSE052 | Ritesh Maan           | AB | 2 | 2 | 2 | 2 | 2 | 2 |
| 76                                                     | 2408TCCSE060 | Ritesh Kumar          | AB | 2 | 2 | 2 | 2 | 2 | 2 |
| 75                                                     | 2408TCCSE121 | Rishi Jaiswal         | AB | 2 | 2 | 2 | 2 | 2 | 2 |
| 74                                                     | 2408TCCSE116 | RAJ ARYAN             | AB | 2 | 2 | 2 | 2 | 2 | 2 |
| 73                                                     | 2408TCCSE107 | Rahul Sehrawat        | AB | 2 | 2 | 2 | 2 | 2 | 2 |



| S. No. | Enrollment No. | Student Name | Roll No. | Q1(4) | Q2(4) | Q3(4) | Q4(4) | Q5(4) | Q6(4) | Q7(4) | Q8(4) | Q9(4) | Q10(4) | Q11(4) | Q12(4) | Q13(4) | Q14(4) | Q15(4) | Q16(4) | Q17(4) | Q18(4) | Q19(4) | Q20(4) | Q21(4) | Q22(4) | Q23(4) | Q24(4) | Q25(4) | Q26(4) | Q27(4) | Q28(4) | Q29(4) | Q30(4) | Q31(4) | Q32(4) | Q33(4) | Q34(4) | Q35(4) | Q36(4) | Q37(4) | Q38(4) | Q39(4) | Q40(4) | Q41(4) | Q42(4) | Q43(4) | Q44(4) | Q45(4) | Q46(4) | Q47(4) | Q48(4) | Q49(4) | Q50(4) | Q51(4) | Q52(4) | Q53(4) | Q54(4) | Q55(4) | Q56(4) | Q57(4) | Q58(4) | Q59(4) | Q60(4) | Q61(4) | Q62(4) | Q63(4) | Q64(4) | Q65(4) | Q66(4) | Q67(4) | Q68(4) | Q69(4) | Q70(4) | Q71(4) | Q72(4) | Q73(4) | Q74(4) | Q75(4) | Q76(4) | Q77(4) | Q78(4) | Q79(4) | Q80(4) | Q81(4) | Q82(4) | Q83(4) | Q84(4) | Q85(4) | Q86(4) | Q87(4) | Q88(4) | Q89(4) | Q90(4) | Q91(4) | Q92(4) | Q93(4) | Q94(4) | Q95(4) | Q96(4) | Q97(4) | Q98(4) | Q99(4) | Q100(4) | Q101(4) | Q102(4) | Q103(4) | Q104(4) | Q105(4) | Q106(4) | Q107(4) | Q108(4) | Q109(4) | Q110(4) | Q111(4) | Q112(4) | Q113(4) | Q114(4) | Q115(4) | Q116(4) | Q117(4) | Q118(4) | Q119(4) | Q120(4) | Q121(4) | Q122(4) | Q123(4) | Q124(4) | Q125(4) | Q126(4) | Q127(4) | Q128(4) | Q129(4) | Q130(4) | Q131(4) | Q132(4) | Q133(4) | Q134(4) | Q135(4) | Q136(4) | Q137(4) | Q138(4) | Q139(4) | Q140(4) | Q141(4) | Q142(4) | Q143(4) | Q144(4) | Q145(4) | Q146(4) | Q147(4) | Q148(4) | Q149(4) | Q150(4) | Q151(4) | Q152(4) | Q153(4) | Q154(4) | Q155(4) | Q156(4) | Q157(4) | Q158(4) | Q159(4) | Q160(4) | Q161(4) | Q162(4) | Q163(4) | Q164(4) | Q165(4) | Q166(4) | Q167(4) | Q168(4) | Q169(4) | Q170(4) | Q171(4) | Q172(4) | Q173(4) | Q174(4) | Q175(4) | Q176(4) | Q177(4) | Q178(4) | Q179(4) | Q180(4) | Q181(4) | Q182(4) | Q183(4) | Q184(4) | Q185(4) | Q186(4) | Q187(4) | Q188(4) | Q189(4) | Q190(4) | Q191(4) | Q192(4) | Q193(4) | Q194(4) | Q195(4) | Q196(4) | Q197(4) | Q198(4) | Q199(4) | Q200(4) | Q201(4) | Q202(4) | Q203(4) | Q204(4) | Q205(4) | Q206(4) | Q207(4) | Q208(4) | Q209(4) | Q210(4) | Q211(4) | Q212(4) | Q213(4) | Q214(4) | Q215(4) | Q216(4) | Q217(4) | Q218(4) | Q219(4) | Q220(4) | Q221(4) | Q222(4) | Q223(4) | Q224(4) | Q225(4) | Q226(4) | Q227(4) | Q228(4) | Q229(4) | Q230(4) | Q231(4) | Q232(4) | Q233(4) | Q234(4) | Q235(4) | Q236(4) | Q237(4) | Q238(4) | Q239(4) | Q240(4) | Q241(4) | Q242(4) | Q243(4) | Q244(4) | Q245(4) | Q246(4) | Q247(4) | Q248(4) | Q249(4) | Q250(4) | Q251(4) | Q252(4) | Q253(4) | Q254(4) | Q255(4) | Q256(4) | Q257(4) | Q258(4) | Q259(4) | Q260(4) | Q261(4) | Q262(4) | Q263(4) | Q264(4) | Q265(4) | Q266(4) | Q267(4) | Q268(4) | Q269(4) | Q270(4) | Q271(4) | Q272(4) | Q273(4) | Q274(4) | Q275(4) | Q276(4) | Q277(4) | Q278(4) | Q279(4) | Q280(4) | Q281(4) | Q282(4) | Q283(4) | Q284(4) | Q285(4) | Q286(4) | Q287(4) | Q288(4) | Q289(4) | Q290(4) | Q291(4) | Q292(4) | Q293(4) | Q294(4) | Q295(4) | Q296(4) | Q297(4) | Q298(4) | Q299(4) | Q300(4) | Q301(4) | Q302(4) | Q303(4) | Q304(4) | Q305(4) | Q306(4) | Q307(4) | Q308(4) | Q309(4) | Q310(4) | Q311(4) | Q312(4) | Q313(4) | Q314(4) | Q315(4) | Q316(4) | Q317(4) | Q318(4) | Q319(4) | Q320(4) | Q321(4) | Q322(4) | Q323(4) | Q324(4) | Q325(4) | Q326(4) | Q327(4) | Q328(4) | Q329(4) | Q330(4) | Q331(4) | Q332(4) | Q333(4) | Q334(4) | Q335(4) | Q336(4) | Q337(4) | Q338(4) | Q339(4) | Q340(4) | Q341(4) | Q342(4) | Q343(4) | Q344(4) | Q345(4) | Q346(4) | Q347(4) | Q348(4) | Q349(4) | Q350(4) | Q351(4) | Q352(4) | Q353(4) | Q354(4) | Q355(4) | Q356(4) | Q357(4) | Q358(4) | Q359(4) | Q360(4) | Q361(4) | Q362(4) | Q363(4) | Q364(4) | Q365(4) | Q366(4) | Q367(4) | Q368(4) | Q369(4) | Q370(4) | Q371(4) | Q372(4) | Q373(4) | Q374(4) | Q375(4) | Q376(4) | Q377(4) | Q378(4) | Q379(4) | Q380(4) | Q381(4) | Q382(4) | Q383(4) | Q384(4) | Q385(4) | Q386(4) | Q387(4) | Q388(4) | Q389(4) | Q390(4) | Q391(4) | Q392(4) | Q393(4) | Q394(4) | Q395(4) | Q396(4) | Q397(4) | Q398(4) | Q399(4) | Q400(4) | Q401(4) | Q402(4) | Q403(4) | Q404(4) | Q405(4) | Q406(4) | Q407(4) | Q408(4) | Q409(4) | Q410(4) | Q411(4) | Q412(4) | Q413(4) | Q414(4) | Q415(4) | Q416(4) | Q417(4) | Q418(4) | Q419(4) | Q420(4) | Q421(4) | Q422(4) | Q423(4) | Q424(4) | Q425(4) | Q426(4) | Q427(4) | Q428(4) | Q429(4) | Q430(4) | Q431(4) | Q432(4) | Q433(4) | Q434(4) | Q435(4) | Q436(4) | Q437(4) | Q438(4) | Q439(4) | Q440(4) | Q441(4) | Q442(4) | Q443(4) | Q444(4) | Q445(4) | Q446(4) | Q447(4) | Q448(4) | Q449(4) | Q450(4) | Q451(4) | Q452(4) | Q453(4) | Q454(4) | Q455(4) | Q456(4) | Q457(4) | Q458(4) | Q459(4) | Q460(4) | Q461(4) | Q462(4) | Q463(4) | Q464(4) | Q465(4) | Q466(4) | Q467(4) | Q468(4) | Q469(4) | Q470(4) | Q471(4) | Q472(4) | Q473(4) | Q474(4) | Q475(4) | Q476(4) | Q477(4) | Q478(4) | Q479(4) | Q480(4) | Q481(4) | Q482(4) | Q483(4) | Q484(4) | Q485(4) | Q486(4) | Q487(4) | Q488(4) | Q489(4) | Q490(4) | Q491(4) | Q492(4) | Q493(4) | Q494(4) | Q495(4) | Q496(4) | Q497(4) | Q498(4) | Q499(4) | Q500(4) | Q501(4) | Q502(4) | Q503(4) | Q504(4) | Q505(4) | Q506(4) | Q507(4) | Q508(4) | Q509(4) | Q510(4) | Q511(4) | Q512(4) | Q513(4) | Q514(4) | Q515(4) | Q516(4) | Q517(4) | Q518(4) | Q519(4) | Q520(4) | Q521(4) | Q522(4) | Q523(4) | Q524(4) | Q525(4) | Q526(4) | Q527(4) | Q528(4) | Q529(4) | Q530(4) | Q531(4) | Q532(4) | Q533(4) | Q534(4) | Q535(4) | Q536(4) | Q537(4) | Q538(4) | Q539(4) | Q540(4) | Q541(4) | Q542(4) | Q543(4) | Q544(4) | Q545(4) | Q546(4) | Q547(4) | Q548(4) | Q549(4) | Q550(4) | Q551(4) | Q552(4) | Q553(4) | Q554(4) | Q555(4) | Q556(4) | Q557(4) | Q558(4) | Q559(4) | Q560(4) | Q561(4) | Q562(4) | Q563(4) | Q564(4) | Q565(4) | Q566(4) | Q567(4) | Q568(4) | Q569(4) | Q570(4) | Q571(4) | Q572(4) | Q573(4) | Q574(4) | Q575(4) | Q576(4) | Q577(4) | Q578(4) | Q579(4) | Q580(4) | Q581(4) | Q582(4) | Q583(4) | Q584(4) | Q585(4) | Q586(4) | Q587(4) | Q588(4) | Q589(4) | Q590(4) | Q591(4) | Q592(4) | Q593(4) | Q594(4) | Q595(4) | Q596(4) | Q597(4) | Q598(4) | Q599(4) | Q600(4) | Q601(4) | Q602(4) | Q603(4) | Q604(4) | Q605(4) | Q606(4) | Q607(4) | Q608(4) | Q609(4) | Q610(4) | Q611(4) | Q612(4) | Q613(4) | Q614(4) | Q615(4) | Q616(4) | Q617(4) | Q618(4) | Q619(4) | Q620(4) | Q621(4) | Q622(4) | Q623(4) | Q624(4) | Q625(4) | Q626(4) | Q627(4) | Q628(4) | Q629(4) | Q630(4) | Q631(4) | Q632(4) | Q633(4) | Q634(4) | Q635(4) | Q636(4) | Q637(4) | Q638(4) | Q639(4) | Q640(4) | Q641(4) | Q642(4) | Q643(4) | Q644(4) | Q645(4) | Q646(4) | Q647(4) | Q648(4) | Q649(4) | Q650(4) | Q651(4) | Q652(4) | Q653(4) | Q654(4) | Q655(4) | Q656(4) | Q657(4) | Q658(4) | Q659(4) | Q660(4) | Q661(4) | Q662(4) | Q663(4) | Q664(4) | Q665(4) | Q666(4) | Q667(4) | Q668(4) | Q669(4) | Q670(4) | Q671(4) | Q672(4) | Q673(4) | Q674(4) | Q675(4) | Q676(4) | Q677(4) | Q678(4) | Q679(4) | Q680(4) | Q681(4) | Q682(4) | Q683(4) | Q684(4) | Q685(4) | Q686(4) | Q687(4) | Q688(4) | Q689(4) | Q690(4) | Q691(4) | Q692(4) | Q693(4) | Q694(4) | Q695(4) | Q696(4) | Q697(4) | Q698(4) | Q699(4) | Q700(4) | Q701(4) | Q702(4) | Q703(4) | Q704(4) | Q705(4) | Q706(4) | Q707(4) | Q708(4) | Q709(4) | Q710(4) | Q711(4) | Q712(4) | Q713(4) | Q714(4) | Q715(4) | Q716(4) | Q717(4) | Q718(4) | Q719(4) | Q720(4) | Q721(4) | Q722(4) | Q723(4) | Q724(4) | Q725(4) | Q726(4) | Q727(4) | Q728(4) | Q729(4) | Q730(4) | Q731(4) | Q732(4) | Q733(4) | Q734(4) | Q735(4) | Q736(4) | Q737(4) | Q738(4) | Q739(4) | Q740(4) | Q741(4) | Q742(4) | Q743(4) | Q744(4) | Q745(4) | Q746(4) | Q747(4) | Q748(4) | Q749(4) | Q750(4) | Q751(4) | Q752(4) | Q753(4) | Q754(4) | Q755(4) | Q756(4) | Q757(4) | Q758(4) | Q759(4) | Q760(4) | Q761(4) | Q762(4) | Q763(4) | Q764(4) | Q765(4) | Q766(4) | Q767(4) | Q768(4) | Q769(4) | Q770(4) | Q771(4) | Q772(4) | Q773(4) | Q774(4) | Q775(4) | Q776(4) | Q777(4) | Q778(4) | Q779(4) | Q780(4) | Q781(4) | Q782(4) | Q783(4) | Q784(4) | Q785(4) | Q786(4) | Q787(4) | Q788(4) | Q789(4) | Q790(4) | Q791(4) | Q792(4) | Q793(4) | Q794(4) | Q795(4) | Q796(4) | Q797(4) | Q798(4) | Q799(4) | Q800(4) | Q801(4) | Q802(4) | Q803(4) | Q804(4) | Q805(4) | Q806(4) | Q807(4) | Q808(4) | Q809(4) | Q810(4) | Q811(4) | Q812(4) | Q813(4) | Q814(4) | Q815(4) | Q816(4) | Q817(4) | Q818(4) | Q819(4) | Q820(4) | Q821(4) | Q822(4) | Q823(4) | Q824(4) | Q825(4) | Q826(4) | Q827(4) | Q828(4) | Q829(4) | Q830(4) | Q831(4) | Q832(4) | Q833(4) | Q834(4) | Q835(4) | Q836(4) | Q837(4) | Q838(4) | Q839(4) | Q840(4) | Q841(4) | Q842(4) | Q843(4) | Q844(4) | Q845(4) | Q846(4) | Q847(4) | Q848(4) | Q849(4) | Q850(4) | Q851(4) | Q852(4) | Q853(4) | Q854(4) | Q855(4) | Q856(4) | Q857(4) | Q858(4) | Q859(4) | Q860(4) | Q861(4) | Q862(4) | Q863(4) | Q864(4) | Q865(4) | Q866(4) | Q867(4) | Q868(4) | Q869(4) | Q870(4) | Q871(4) | Q872(4) | Q873(4) | Q874(4) | Q875(4) | Q876(4) | Q877(4) | Q878(4) | Q879(4) | Q880(4) | Q881(4) | Q882(4) | Q883(4) | Q884(4) | Q885(4) | Q886(4) | Q887(4) | Q888(4) | Q889(4) | Q890(4) | Q891(4) | Q892(4) | Q893(4) | Q894(4) | Q895(4) | Q896(4) | Q897(4) | Q898(4) | Q899(4) | Q900(4) | Q901(4) | Q902(4) | Q903(4) | Q904(4) | Q905(4) | Q906(4) | Q907(4) | Q908(4) | Q909(4) | Q910(4) | Q911(4) | Q912(4) | Q913(4) | Q914(4) | Q915(4) | Q916(4) | Q917(4) | Q918(4) | Q919(4) | Q920(4) | Q921(4) | Q922(4) | Q923(4) | Q924(4) | Q925(4) | Q926(4) | Q927(4) | Q928(4) | Q929(4) | Q930(4) | Q931(4) | Q932(4) | Q933(4) | Q934(4) | Q935(4) | Q936(4) | Q937(4) | Q938(4) | Q939(4) | Q940(4) | Q941(4) | Q942(4) | Q943(4) | Q944(4) | Q945(4) | Q946(4) | Q947(4) | Q948(4) | Q949(4) | Q950(4) | Q951(4) | Q952(4) | Q953(4) | Q954(4) | Q955(4) | Q956(4) | Q957(4) | Q958(4) | Q959(4) | Q960(4) | Q961(4) | Q962(4) | Q963(4) | Q964(4) | Q965(4) | Q966(4) | Q967(4) | Q968(4) | Q969(4) | Q970(4) | Q971(4) | Q972(4) | Q973(4) | Q974(4) | Q975(4) | Q976(4) | Q977(4) | Q978(4) | Q979(4) | Q980(4) | Q981(4) | Q982(4) | Q983(4) | Q984(4) | Q985(4) | Q986(4) | Q987(4) | Q988(4) | Q989(4) | Q990(4) | Q991(4) | Q992(4) | Q993(4) | Q994(4) | Q995(4) | Q996(4) | Q997(4) | Q998(4) | Q999(4) | Q1000(4) |
|--------|----------------|--------------|----------|-------|-------|-------|-------|-------|-------|-------|-------|-------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|----------|
|--------|----------------|--------------|----------|-------|-------|-------|-------|-------|-------|-------|-------|-------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|----------|



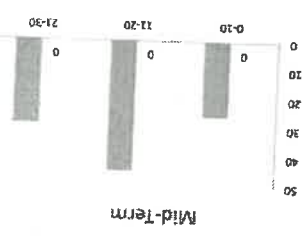
*Manoj*

| COs Attainment Level | CO1 | CO2 |
|----------------------|-----|-----|
|                      | 2   | 2   |

| Mid-Term | Level 1                                                 | Level 2                                                        | Level 3                                                 |
|----------|---------------------------------------------------------|----------------------------------------------------------------|---------------------------------------------------------|
|          | Less than 50% students scoring more than average marks. | 50% to less than 60% students scoring more than average marks. | More than 60% students scoring more than average marks. |

| Mid-Term | Level 1 | Level 2 | Level 3 |
|----------|---------|---------|---------|
|          | 21-30   | 31-40   | 41-50   |

| Max Marks | Min Marks | Std Deviat on | Less than 90% | 4.0% |
|-----------|-----------|---------------|---------------|------|
| 25        | 7.18      | 29.00%        | 4.0%          |      |



| Sl. No. | Student Name          | Level 1 | Level 2 | Level 3 | Total | Average | CO attainment (PN)*100 |
|---------|-----------------------|---------|---------|---------|-------|---------|------------------------|
| 73      | Rahul Sehrawat        | 2       | 2       | 2       | 6     | 4       | 44.00%                 |
| 74      | RAJ ARYAN             | 3       | 4       | 4       | 11    | 4       | 56.00%                 |
| 75      | Rishi Jaiswal         | 4       | 4       | 4       | 12    | 4       | 56.00%                 |
| 76      | Ritesh Kumar          | 4       | 4       | 4       | 12    | 4       | 56.00%                 |
| 77      | Ritesh Kumar          | 4       | 4       | 4       | 12    | 4       | 56.00%                 |
| 78      | Ritesh Maan           | 4       | 4       | 4       | 12    | 4       | 56.00%                 |
| 79      | Rossane Henrick       | 4       | 4       | 4       | 12    | 4       | 56.00%                 |
| 80      | Rupesh Singh          | 4       | 4       | 4       | 12    | 4       | 56.00%                 |
| 81      | Saara Tewathia        | 4       | 4       | 4       | 12    | 4       | 56.00%                 |
| 82      | Saameer Pathwa        | 4       | 4       | 4       | 12    | 4       | 56.00%                 |
| 83      | Saameer Vats          | 4       | 4       | 4       | 12    | 4       | 56.00%                 |
| 84      | Sana Ghosh            | 4       | 4       | 4       | 12    | 4       | 56.00%                 |
| 85      | Sanjeev Kumar         | 4       | 4       | 4       | 12    | 4       | 56.00%                 |
| 86      | Santosh Mehta         | 4       | 4       | 4       | 12    | 4       | 56.00%                 |
| 87      | Santosh Pandey        | 4       | 4       | 4       | 12    | 4       | 56.00%                 |
| 88      | Sarvik Upadhyay       | 4       | 4       | 4       | 12    | 4       | 56.00%                 |
| 89      | Shiv Kumar Ray        | 4       | 4       | 4       | 12    | 4       | 56.00%                 |
| 90      | Shubham Tanwar        | 4       | 4       | 4       | 12    | 4       | 56.00%                 |
| 91      | Soham Verma           | 4       | 4       | 4       | 12    | 4       | 56.00%                 |
| 92      | Srinata Pasricha      | 4       | 4       | 4       | 12    | 4       | 56.00%                 |
| 93      | Suhani Gupta          | 4       | 4       | 4       | 12    | 4       | 56.00%                 |
| 94      | Taksh Rosh Srivastava | 4       | 4       | 4       | 12    | 4       | 56.00%                 |
| 95      | Tanisha Gupta         | 4       | 4       | 4       | 12    | 4       | 56.00%                 |
| 96      | Tanisha Malik         | 4       | 4       | 4       | 12    | 4       | 56.00%                 |
| 97      | Umar                  | 4       | 4       | 4       | 12    | 4       | 56.00%                 |
| 98      | Vipin Singh Yadav     | 4       | 4       | 4       | 12    | 4       | 56.00%                 |
| 99      | Yash Kumar            | 4       | 4       | 4       | 12    | 4       | 56.00%                 |
| 100     | Yash Tanwar           | 4       | 4       | 4       | 12    | 4       | 56.00%                 |
| 101     | Yash Yadav            | 4       | 4       | 4       | 12    | 4       | 56.00%                 |
| 102     | Yashraj Kaurishik     | 4       | 4       | 4       | 12    | 4       | 56.00%                 |
| 103     | Yuvansh Yadav         | 4       | 4       | 4       | 12    | 4       | 56.00%                 |



Program : B.Tech Semester : I



|     |     |   |
|-----|-----|---|
| COs | CO1 | 2 |
|     | CO2 | 1 |
|     | CO3 | 1 |

|            |            |
|------------|------------|
| Assessment | Attainment |
| End term   | Level 1    |
|            | Level 2    |
|            | Level 3    |

|          |      |       |       |
|----------|------|-------|-------|
| Students | 0-20 | 21-40 | 41-60 |
| End term | 39   | 64    | 26    |

|                               |    |    |       |        |      |
|-------------------------------|----|----|-------|--------|------|
| Average Marks                 | 27 | 57 | 13.64 | 36.43% | 2.3% |
| Max Marks                     |    |    |       |        |      |
| Std                           |    |    |       |        |      |
| Mean                          |    |    |       |        |      |
| Var                           |    |    |       |        |      |
| Max                           |    |    |       |        |      |
| Min                           |    |    |       |        |      |
| Sum                           |    |    |       |        |      |
| Count                         |    |    |       |        |      |
| More                          |    |    |       |        |      |
| Less                          |    |    |       |        |      |
| Equal                         |    |    |       |        |      |
| Diff                          |    |    |       |        |      |
| Prod                          |    |    |       |        |      |
| Div                           |    |    |       |        |      |
| Mod                           |    |    |       |        |      |
| Exp                           |    |    |       |        |      |
| Log                           |    |    |       |        |      |
| Sqrt                          |    |    |       |        |      |
| Power                         |    |    |       |        |      |
| Recip                         |    |    |       |        |      |
| Inv                           |    |    |       |        |      |
| Sum of Squares                |    |    |       |        |      |
| Sum of Cubes                  |    |    |       |        |      |
| Sum of Fourth Powers          |    |    |       |        |      |
| Sum of Fifth Powers           |    |    |       |        |      |
| Sum of Sixth Powers           |    |    |       |        |      |
| Sum of Seventh Powers         |    |    |       |        |      |
| Sum of Eighth Powers          |    |    |       |        |      |
| Sum of Ninth Powers           |    |    |       |        |      |
| Sum of Tenth Powers           |    |    |       |        |      |
| Sum of Eleventh Powers        |    |    |       |        |      |
| Sum of Twelfth Powers         |    |    |       |        |      |
| Sum of Thirteenth Powers      |    |    |       |        |      |
| Sum of Fourteenth Powers      |    |    |       |        |      |
| Sum of Fifteenth Powers       |    |    |       |        |      |
| Sum of Sixteenth Powers       |    |    |       |        |      |
| Sum of Seventeenth Powers     |    |    |       |        |      |
| Sum of Eighteenth Powers      |    |    |       |        |      |
| Sum of Nineteenth Powers      |    |    |       |        |      |
| Sum of Twentieth Powers       |    |    |       |        |      |
| Sum of Twenty-First Powers    |    |    |       |        |      |
| Sum of Twenty-Second Powers   |    |    |       |        |      |
| Sum of Twenty-Third Powers    |    |    |       |        |      |
| Sum of Twenty-Fourth Powers   |    |    |       |        |      |
| Sum of Twenty-Fifth Powers    |    |    |       |        |      |
| Sum of Twenty-Sixth Powers    |    |    |       |        |      |
| Sum of Twenty-Seventh Powers  |    |    |       |        |      |
| Sum of Twenty-Eighth Powers   |    |    |       |        |      |
| Sum of Twenty-Ninth Powers    |    |    |       |        |      |
| Sum of Thirtieth Powers       |    |    |       |        |      |
| Sum of Thirty-First Powers    |    |    |       |        |      |
| Sum of Thirty-Second Powers   |    |    |       |        |      |
| Sum of Thirty-Third Powers    |    |    |       |        |      |
| Sum of Thirty-Fourth Powers   |    |    |       |        |      |
| Sum of Thirty-Fifth Powers    |    |    |       |        |      |
| Sum of Thirty-Sixth Powers    |    |    |       |        |      |
| Sum of Thirty-Seventh Powers  |    |    |       |        |      |
| Sum of Thirty-Eighth Powers   |    |    |       |        |      |
| Sum of Thirty-Ninth Powers    |    |    |       |        |      |
| Sum of Fortieth Powers        |    |    |       |        |      |
| Sum of Forty-First Powers     |    |    |       |        |      |
| Sum of Forty-Second Powers    |    |    |       |        |      |
| Sum of Forty-Third Powers     |    |    |       |        |      |
| Sum of Forty-Fourth Powers    |    |    |       |        |      |
| Sum of Forty-Fifth Powers     |    |    |       |        |      |
| Sum of Forty-Sixth Powers     |    |    |       |        |      |
| Sum of Forty-Seventh Powers   |    |    |       |        |      |
| Sum of Forty-Eighth Powers    |    |    |       |        |      |
| Sum of Forty-Ninth Powers     |    |    |       |        |      |
| Sum of Fiftieth Powers        |    |    |       |        |      |
| Sum of Fifty-First Powers     |    |    |       |        |      |
| Sum of Fifty-Second Powers    |    |    |       |        |      |
| Sum of Fifty-Third Powers     |    |    |       |        |      |
| Sum of Fifty-Fourth Powers    |    |    |       |        |      |
| Sum of Fifty-Fifth Powers     |    |    |       |        |      |
| Sum of Fifty-Sixth Powers     |    |    |       |        |      |
| Sum of Fifty-Seventh Powers   |    |    |       |        |      |
| Sum of Fifty-Eighth Powers    |    |    |       |        |      |
| Sum of Fifty-Ninth Powers     |    |    |       |        |      |
| Sum of Sixtieth Powers        |    |    |       |        |      |
| Sum of Sixty-First Powers     |    |    |       |        |      |
| Sum of Sixty-Second Powers    |    |    |       |        |      |
| Sum of Sixty-Third Powers     |    |    |       |        |      |
| Sum of Sixty-Fourth Powers    |    |    |       |        |      |
| Sum of Sixty-Fifth Powers     |    |    |       |        |      |
| Sum of Sixty-Sixth Powers     |    |    |       |        |      |
| Sum of Sixty-Seventh Powers   |    |    |       |        |      |
| Sum of Sixty-Eighth Powers    |    |    |       |        |      |
| Sum of Sixty-Ninth Powers     |    |    |       |        |      |
| Sum of Seventieth Powers      |    |    |       |        |      |
| Sum of Seventy-First Powers   |    |    |       |        |      |
| Sum of Seventy-Second Powers  |    |    |       |        |      |
| Sum of Seventy-Third Powers   |    |    |       |        |      |
| Sum of Seventy-Fourth Powers  |    |    |       |        |      |
| Sum of Seventy-Fifth Powers   |    |    |       |        |      |
| Sum of Seventy-Sixth Powers   |    |    |       |        |      |
| Sum of Seventy-Seventh Powers |    |    |       |        |      |
| Sum of Seventy-Eighth Powers  |    |    |       |        |      |
| Sum of Seventy-Ninth Powers   |    |    |       |        |      |
| Sum of Eightieth Powers       |    |    |       |        |      |
| Sum of Eighty-First Powers    |    |    |       |        |      |
| Sum of Eighty-Second Powers   |    |    |       |        |      |
| Sum of Eighty-Third Powers    |    |    |       |        |      |
| Sum of Eighty-Fourth Powers   |    |    |       |        |      |
| Sum of Eighty-Fifth Powers    |    |    |       |        |      |
| Sum of Eighty-Sixth Powers    |    |    |       |        |      |
| Sum of Eighty-Seventh Powers  |    |    |       |        |      |
| Sum of Eighty-Eighth Powers   |    |    |       |        |      |
| Sum of Eighty-Ninth Powers    |    |    |       |        |      |
| Sum of Ninetieth Powers       |    |    |       |        |      |
| Sum of Ninety-First Powers    |    |    |       |        |      |
| Sum of Ninety-Second Powers   |    |    |       |        |      |
| Sum of Ninety-Third Powers    |    |    |       |        |      |
| Sum of Ninety-Fourth Powers   |    |    |       |        |      |
| Sum of Ninety-Fifth Powers    |    |    |       |        |      |
| Sum of Ninety-Sixth Powers    |    |    |       |        |      |
| Sum of Ninety-Seventh Powers  |    |    |       |        |      |
| Sum of Ninety-Eighth Powers   |    |    |       |        |      |
| Sum of Ninety-Ninth Powers    |    |    |       |        |      |
| Sum of One Hundred Powers     |    |    |       |        |      |



### End-Term Examination

[illegible]

Manoj



| School of Engineering and Technology, Sushant University, Gurugram |           |                                             |                                             |
|--------------------------------------------------------------------|-----------|---------------------------------------------|---------------------------------------------|
| Academic Year - Even Semester 2023-24                              |           |                                             |                                             |
| Course: B.Tech                                                     |           |                                             |                                             |
| Course Name: Mathematics I                                         |           |                                             |                                             |
| Faculty Name: Dr. Manimala                                         |           |                                             |                                             |
| Date of Survey: 28/12/2024                                         |           |                                             |                                             |
| Course Code: 23BTC-0MA11T                                          |           |                                             |                                             |
| Sem: I                                                             |           |                                             |                                             |
| Course Exit Survey                                                 |           |                                             |                                             |
| Student Full Name                                                  | survey    | Attainment of survey parameter <sup>3</sup> | Attainment of survey parameter <sup>4</sup> |
| Aarti Negi                                                         | Very Good | 20 Very Good                                | 20 Very Good                                |
| Aaryan Kashyap                                                     | Very Good | 20 Very Good                                | 20 Very Good                                |
| Aashi Thakran                                                      | Very Good | 20 Very Good                                | 20 Excellent                                |
| Abhinav Ranga                                                      | Very Good | 20 Excellent                                | 20 Excellent                                |
| Aditya chaudhary                                                   | Excellent | 20 Excellent                                | 20 Excellent                                |
| Akshat Shukla                                                      | Good      | 20 Very Good                                | 20 Excellent                                |
| Akshit Mathur                                                      | Very Good | 20 Very Good                                | 20 Good                                     |
| Ankit Nagar                                                        | Very Good | 20 Very Good                                | 20 Very Good                                |
| Anuj Kumar                                                         | Excellent | 20 Excellent                                | 20 Excellent                                |
| Aryan Kumar                                                        | Excellent | 20 Good                                     | 18 Fair                                     |
| Aryan Napti                                                        | Very Good | 20 Good                                     | 18 Good                                     |
| Ashank Sharma                                                      | Very Good | 20 Good                                     | 20 Very Good                                |
| Ashish Kumar Sharma                                                | Very Good | 20 Very Good                                | 20 Very Good                                |
| Astik Gupta                                                        | Very Good | 20 Very Good                                | 20 Excellent                                |
| Atharv Malik                                                       | Very Good | 20 Very Good                                | 20 Excellent                                |
| Avnish                                                             | Excellent | 20 Excellent                                | 20 Excellent                                |
| Aysha Gupta                                                        | Good      | 20 Very Good                                | 20 Excellent                                |
| Bhavik Chawla                                                      | Very Good | 20 Very Good                                | 20 Good                                     |
| Bhavik Shankar                                                     | Very Good | 20 Very Good                                | 20 Very Good                                |
| Deeksha Soraj                                                      | Excellent | 20 Excellent                                | 20 Excellent                                |
| Deepak Phogat                                                      | Excellent | 20 Very Good                                | 20 Very Good                                |
| Dhruv Yadav                                                        | Good      | 18 Good                                     | 18 Good                                     |
| Dhruv Yadav                                                        | Very Good | 20 Very Good                                | 20 Very Good                                |
| Dishant                                                            | Excellent | 20 Excellent                                | 20 Very Good                                |
| Divyansh Kaushik                                                   | Very Good | 20 Excellent                                | 20 Very Good                                |
| Divyanshu Rana                                                     | Excellent | 20 Good                                     | 20 Very Good                                |
| Drishika Aneja                                                     | Very Good | 20 Good                                     | 18 Fair                                     |
| Faizan Khan                                                        | Excellent | 20 Very Good                                | 18 Good                                     |
| Harsh Sharma                                                       | Good      | 18 Very Good                                | 20 Excellent                                |
| Harshit Chhillar                                                   | Very Good | 20 Very Good                                | 20 Good                                     |
| Harshit Kumar Pandey                                               | Very Good | 20 Very Good                                | 20 Very Good                                |
| HARSHITA KAKKAR                                                    | Excellent | 20 Excellent                                | 20 Excellent                                |
| Imanshu Kumar Chaudhary                                            | Excellent | 20 Very Good                                | 20 Excellent                                |
| Jai Kumar Jha                                                      | Good      | 18 Good                                     | 18 Good                                     |
| Jatin Rana                                                         | Very Good | 20 Very Good                                | 20 Very Good                                |
| Jayant Gaur                                                        | Very Good | 20 Very Good                                | 20 Very Good                                |
| Kanishk Gaur                                                       | Very Good | 20 Very Good                                | 20 Excellent                                |
| Kanishka Srivastava                                                | Very Good | 20 Excellent                                | 20 Excellent                                |
| Kanishka Yadav                                                     | Excellent | 20 Very Good                                | 20 Excellent                                |
| Kausht Yadav                                                       | Good      | 18 Very Good                                | 20 Good                                     |
| Krishna Gemini                                                     | Very Good | 20 Very Good                                | 20 Very Good                                |
| Krish Sharma                                                       | Very Good | 20 Very Good                                | 20 Excellent                                |
| Kumar Aryan                                                        | Excellent | 20 Excellent                                | 20 Excellent                                |
| Kunal Joon                                                         | Excellent | 20 Very Good                                | 20 Very Good                                |
| Kyathika Rao Seelam                                                | Good      | 18 Good                                     | 18                                          |



*Handwritten signature*

|                       |           |    |           |    |           |    |
|-----------------------|-----------|----|-----------|----|-----------|----|
| Lakshita              | Very Good | 20 | Very Good | 20 | Very Good | 20 |
| Manan Kochar          | Excellent | 20 | Excellent | 20 | Excellent | 20 |
| Mayank Kaushik        | Excellent | 20 | Very Good | 20 | Very Good | 20 |
| Mayank Rathore        | Good      | 18 | Good      | 18 | Good      | 18 |
| Mayank Sharma         | Very Good | 20 | Very Good | 20 | Very Good | 20 |
| Mohamed khilid khilid | Very Good | 20 | Very Good | 20 | Very Good | 20 |
| Mohamoud Allaadeen    | Very Good | 20 | Very Good | 20 | Excellent | 20 |



*Mohd Hamza*

|                       |           |    |           |    |           |    |
|-----------------------|-----------|----|-----------|----|-----------|----|
| Mohd Hamza            | Very Good | 20 | Excellent | 20 | Excellent | 20 |
| Mohit Naharwa         | Excellent | 20 | Very Good | 20 | Excellent | 20 |
| Naresh Kumar          | Good      | 18 | Very Good | 20 | Good      | 20 |
| Neeraj Rana           | Very Good | 20 | Very Good | 20 | Good      | 18 |
| Nihal Pandey          | Very Good | 20 | Very Good | 20 | Excellent | 20 |
| Nikhil Patel          | Excellent | 20 | Excellent | 20 | Excellent | 20 |
| Nitin Sehrawat        | Excellent | 20 | Excellent | 20 | Excellent | 20 |
| Palak Shrivastav      | Very Good | 20 | Very Good | 20 | Very Good | 20 |
| Parineeta             | Very Good | 20 | Good      | 18 | Good      | 18 |
| Payal Yadav yadav     | Very Good | 20 | Very Good | 20 | Very Good | 20 |
| Piyush Choubey        | Very Good | 20 | Very Good | 20 | Very Good | 20 |
| Poorav Yadav          | Very Good | 20 | Very Good | 20 | Excellent | 20 |
| Pragya                | Excellent | 20 | Excellent | 20 | Excellent | 20 |
| Prashant Sharma       | Good      | 20 | Very Good | 18 | Good      | 20 |
| Prince Bhardwal       | Very Good | 20 | Very Good | 20 | Good      | 18 |
| Rahul sehrawat        | Very Good | 20 | Very Good | 20 | Very Good | 20 |
| RAJ ARYAN             | Excellent | 20 | Very Good | 20 | Excellent | 20 |
| Rishi Jaiswal         | Excellent | 20 | Excellent | 20 | Excellent | 20 |
| Ritesh Kumar          | Good      | 18 | Good      | 18 | Very Good | 20 |
| Ritesh Maan           | Very Good | 20 | Very Good | 20 | Good      | 18 |
| Rossane Henrick       | Excellent | 20 | Very Good | 20 | Very Good | 20 |
| Rupesh Singh          | Very Good | 20 | Very Good | 20 | Very Good | 20 |
| Saara Tewathia        | Excellent | 20 | Good      | 20 | Very Good | 20 |
| Sameer Pahwa          | Very Good | 20 | Good      | 20 | Fair      | 16 |
| Sameer Vats           | Excellent | 20 | Good      | 18 | Good      | 18 |
| Sana Ghosh            | Good      | 18 | Very Good | 20 | Excellent | 20 |
| Sanjeev Kumar         | Very Good | 20 | Very Good | 20 | Good      | 18 |
| Sarthak Mehta         | Very Good | 20 | Very Good | 20 | Very Good | 20 |
| Sarthak Pandey        | Excellent | 20 | Very Good | 20 | Excellent | 20 |
| Satvik Upadhyay       | Excellent | 20 | Excellent | 20 | Excellent | 20 |
| Shiv Kumar Ray        | Good      | 18 | Very Good | 20 | Very Good | 20 |
| Shubham Tanwar        | Very Good | 20 | Good      | 18 | Good      | 18 |
| Soham Verma           | Very Good | 20 | Very Good | 20 | Very Good | 20 |
| Sritara pasricha      | Very Good | 20 | Very Good | 20 | Very Good | 20 |
| Suhani Gupta          | Very Good | 20 | Excellent | 20 | Excellent | 20 |
| Taksh Rood Srivastava | Excellent | 20 | Very Good | 20 | Excellent | 20 |
| Tanishka Gupta        | Good      | 18 | Very Good | 20 | Good      | 20 |
| Taniya Malik          | Very Good | 20 | Very Good | 20 | Very Good | 20 |
| Unnati                | Very Good | 20 | Very Good | 20 | Excellent | 20 |



| Assessment Methods |        |                                                         | Attainment Levels |
|--------------------|--------|---------------------------------------------------------|-------------------|
| Assessment         | Level1 | 50% students scoring more than average marks.           |                   |
|                    | Level2 | 50% to less than 60% students scoring more than average |                   |
|                    | Level3 | 60% students scoring more than average marks in         |                   |

|                       |           |             |           |             |           |             |
|-----------------------|-----------|-------------|-----------|-------------|-----------|-------------|
| Varsna                | Excellent | 20          | Excellent | 20          | Excellent | 20          |
| Vipin Singh Yadav     | Excellent | 20          | Very Good | 20          | Very Good | 20          |
| Yash Kumar            | Good      | 18          | Good      | 18          | Good      | 18          |
| Yash Tanwar           | Very Good | 20          | Very Good | 20          | Very Good | 20          |
| Yash Yadav            | Excellent | 20          | Excellent | 20          | Excellent | 20          |
| Yashraj Kaushik       | Good      | 20          | Good      | 20          | Good      | 20          |
| Vuvansh Yadav         | Good      | 18          | Good      | 18          | Good      | 18          |
| Average               |           | 19.62962963 |           | 19.66666667 |           | 19.48148148 |
| No of students >= Ave |           | 44          |           | 45          |           | 41          |
| Total students        |           | 70          |           | 70          |           | 70          |
| Attainment Level (%)  |           | 62.86%      |           | 64.29%      |           | 58.57%      |
| Attainment Level      |           | 3           |           | 3           |           | 3           |

M. V. University



*Handwritten signature*

|                                      |              |                |              |
|--------------------------------------|--------------|----------------|--------------|
| SUSHANT UNIVERSITY                   |              |                |              |
| School of Engineering and Technology |              |                |              |
| CO Attainment                        |              |                |              |
| Sem: I                               |              |                |              |
| Course Name: Mathematics I           |              |                |              |
| Faculty Name: Dr Manimala            |              |                |              |
| Date of Analysis: 28/12/2024         |              |                |              |
| Course Code: 23BTC-0MA11T            |              |                |              |
| COs                                  | Direct (80%) | Indirect (20%) | Total (100%) |
| CO1                                  | 2.25         | 3              | 2.4          |
| CO2                                  | 1.65         | 3              | 1.92         |
| CO3                                  | 1.35         | 3              | 1.68         |



*Mani*

|                                                                                                                                                                                                                                                                                                                            |                                                    |                       |              |              |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------|-----------------------|--------------|--------------|
| <b>SUSHANT UNIVERSITY</b><br><b>School of Engineering and Technology</b><br><b>Result Analysis (Even Semester 2023-24)</b><br><b>Program: B.Tech</b><br><b>Course Name: Mathematics I</b><br><b>Faculty Name: Dr. Manimala</b><br><b>Sem: I</b><br><b>Course Code: 23BTC-0MA11T</b><br><b>Date of Analysis: 28/12/2024</b> |                                                    |                       |              |              |
| <b>Consolidated CO Attainment (Internal)</b>                                                                                                                                                                                                                                                                               |                                                    |                       |              |              |
| <b>Mid term 15 : Assignment/Presentation 25</b>                                                                                                                                                                                                                                                                            |                                                    |                       |              |              |
| <b>COs</b>                                                                                                                                                                                                                                                                                                                 | <b>Assessment Tools</b>                            |                       |              |              |
|                                                                                                                                                                                                                                                                                                                            | <b>Mid-Term</b>                                    | <b>Assignment</b>     | <b>Quiz</b>  | <b>Total</b> |
| <b>CO1</b>                                                                                                                                                                                                                                                                                                                 | 2                                                  | 3                     | 3            | 2.625        |
| <b>CO2</b>                                                                                                                                                                                                                                                                                                                 | 2                                                  | 3                     |              | 2.625        |
| <b>CO3</b>                                                                                                                                                                                                                                                                                                                 |                                                    | 3                     |              | 1.875        |
| <b>Consolidated CO Attainment (Internal+External)</b>                                                                                                                                                                                                                                                                      |                                                    |                       |              |              |
| <b>Internal 40 : External 60</b>                                                                                                                                                                                                                                                                                           |                                                    |                       |              |              |
| <b>COs</b>                                                                                                                                                                                                                                                                                                                 | <b>Internal (Mid term+Assignment+Presentation)</b> | <b>End Term (ESE)</b> | <b>Total</b> |              |
| <b>CO1</b>                                                                                                                                                                                                                                                                                                                 | 2.625                                              | 2                     | 2.25         |              |
| <b>CO2</b>                                                                                                                                                                                                                                                                                                                 | 2.625                                              | 1                     | 1.65         |              |
| <b>CO3</b>                                                                                                                                                                                                                                                                                                                 | 1.875                                              | 1                     | 1.35         |              |



*Manish*

| COs             | PO1  | PO2  | PO3  | PO4  | PO5  | PO6  | PO7  | PO8  | PO9  | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|-----------------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| CO1=2.4         | 7.2  | 7.2  | 2.4  | 2.4  | 2.4  | 4.8  | 2.4  | 2.4  | 2.4  | 4.8  | 4.8  | 4.8  | 7.2  | 7.2  | 2.4  |
| CO2=1.92        | 5.76 | 5.76 | 1.92 | 3.84 | 3.84 | 3.84 | 3.84 | 3.84 | 1.92 | 5.76 | 5.76 | 1.92 | 3.84 | 5.76 | 1.92 |
| CO3=2.00 / 1.68 | 5.04 | 5.04 | 1.68 | 5.04 | 3.36 | 5.04 | 5.04 | 3.36 | 1.68 | 3.36 | 3.36 | 1.68 | 5.04 | 5.04 | 1.68 |
| Attainment      | 2.00 | 2.00 | 2.00 | 1.88 | 1.92 | 1.95 | 1.88 | 1.92 | 2.00 | 1.99 | 1.99 | 2.10 | 2.12 | 2.00 | 2.00 |

| COs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| CO1 | 3   | 3   | 1   | 1   | 1   | 2   | 1   | 1   | 2   | 2    | 2    | 2    | 3    | 3    | 1    |
| CO2 | 3   | 3   | 1   | 2   | 2   | 2   | 2   | 1   | 3   | 3    | 1    | 1    | 2    | 3    | 1    |
| CO3 | 3   | 3   | 1   | 3   | 2   | 3   | 3   | 2   | 1   | 2    | 2    | 1    | 1    | 3    | 1    |

Program: B.Tech  
 Course Name: Mathematics I  
 Faculty Name: Dr. Manimata  
 School of Engineering and Technology  
 SUSANT UNIVERSITY  
 CO-PO-PSO Mapping  
 Sem: I  
 Course Code: 23BTC-0MA11T  
 Date of Analysis: 28/12/2024

|                       |
|-----------------------|
| Legend                |
| EP: Total             |
| AB: Absent            |
| DB: Debarred          |
| DE: Deferred          |
| UFM: Under Means      |
| Pass with Grace Marks |

**SUSHANT UNIVERSITY, SECTOR-55, GURGAON**  
**End Semester Examination: Regular (December, 2024)**  
**B.Tech - CSE- Semester-1**

| Sub Code                |                     |                 |       | 23BTC-0ED11C                  |       |       |       | 23BTC-0EE11C                                     |       |       |       | 23BTC-0IP11C                |       |       |       | 23BTC-0MA11T  |       |       |       | 23BTC-0PY11C |       |       |       | 23BTC-0WS11C |       |       |       | 24BTC-0PY11C |       |       |  | EVS2211               |  |  |  | SE151                  |  |  |  |
|-------------------------|---------------------|-----------------|-------|-------------------------------|-------|-------|-------|--------------------------------------------------|-------|-------|-------|-----------------------------|-------|-------|-------|---------------|-------|-------|-------|--------------|-------|-------|-------|--------------|-------|-------|-------|--------------|-------|-------|--|-----------------------|--|--|--|------------------------|--|--|--|
| Subject Name            |                     |                 |       | Engineering Graphics & Design |       |       |       | Basics of Electronics and Electrical Engineering |       |       |       | Introduction to Programming |       |       |       | Mathematics-I |       |       |       | Physics      |       |       |       | Workshop     |       |       |       | Python       |       |       |  | Environmental Studies |  |  |  | Universal Human Values |  |  |  |
| Total Credit Point (21) |                     |                 |       | 3                             |       |       |       | 5                                                |       |       |       | 4                           |       |       |       | 4             |       |       |       | 5            |       |       |       | 3            |       |       |       | 1            |       |       |  | 2                     |  |  |  | 2                      |  |  |  |
| S.No                    | Student Roll Number | Student Name    | SGPA  | Exam Name                     | Marks | Grade | Marks | Grade                                            | Marks | Grade | Marks | Grade                       | Marks | Grade | Marks | Grade         | Marks | Grade | Marks | Grade        | Marks | Grade | Marks | Grade        | Marks | Grade | Marks | Grade        | Marks | Grade |  |                       |  |  |  |                        |  |  |  |
| 1                       | 240BTCSE001         | NIHAL PANDEY    | 7.000 | EP                            | -     | -     | 63    | B                                                | 73    | B+    | 67    | B                           | -     | -     | 87    | A+            | 76    | A     | 73    | B+           | 44    | -     | 78    | A            | -     | -     | -     | -            | -     | -     |  |                       |  |  |  |                        |  |  |  |
|                         |                     |                 |       | External                      | -     | -     | 37    | -                                                | 45    | -     | 38    | -                           | -     | -     | 52    | -             | 48    | -     | 44    | -            | -     | -     | -     | -            | -     | -     | -     | -            | -     | -     |  |                       |  |  |  |                        |  |  |  |
|                         |                     |                 |       | Internal                      | -     | -     | 26    | -                                                | 28    | -     | 28.5  | -                           | -     | -     | 35    | -             | 28    | -     | 29    | -            | -     | -     | -     | -            | -     | -     | -     | -            | -     | -     |  |                       |  |  |  |                        |  |  |  |
| 2                       | 240BTCSE002         | ROSSANE HENRICK |       | EP                            |       |       |       |                                                  |       |       |       |                             |       |       |       |               |       |       |       |              |       |       |       |              |       |       |       |              |       |       |  |                       |  |  |  |                        |  |  |  |
|                         |                     |                 |       | External                      |       |       |       |                                                  |       |       |       |                             |       |       |       |               |       |       |       |              |       |       |       |              |       |       |       |              |       |       |  |                       |  |  |  |                        |  |  |  |
|                         |                     |                 |       | Internal                      |       |       |       |                                                  |       |       |       |                             |       |       |       |               |       |       |       |              |       |       |       |              |       |       |       |              |       |       |  |                       |  |  |  |                        |  |  |  |
| 3                       | 240BTCSE003         | DRISHIKA ANEJA  | 9.095 | EP                            | 80    | A     | -     | -                                                | 96    | O     | 84    | A                           | 97    | O     | -     | -             | 90    | A+    | 91    | A+           | 92    | -     | 92    | A+           | -     | -     | -     | -            | -     | -     |  |                       |  |  |  |                        |  |  |  |
|                         |                     |                 |       | External                      | 45    | -     | -     | -                                                | 56    | -     | 48    | -                           | 60    | -     | -     | -             | 55    | -     | 52    | -            | -     | -     | -     | -            | -     | -     | -     | -            | -     | -     |  |                       |  |  |  |                        |  |  |  |
|                         |                     |                 |       | Internal                      | 35    | -     | -     | -                                                | 40    | -     | 35.5  | -                           | 37    | -     | -     | -             | 35    | -     | 39    | -            | 92    | -     | -     | -            | -     | -     | -     | -            | -     | -     |  |                       |  |  |  |                        |  |  |  |
| 4                       | 240BTCSE004         | PRINCE BHARDWAJ | 9.238 | EP                            | -     | -     | 95    | O                                                | 90    | A+    | 91    | A+                          | -     | -     | 91    | A+            | 94    | A+    | 90    | A+           | 93    | A+    | -     | -            | -     | -     | -     | -            | -     | -     |  |                       |  |  |  |                        |  |  |  |
|                         |                     |                 |       | External                      | -     | -     | 56    | -                                                | 54    | -     | 57    | -                           | -     | -     | 56    | -             | 57    | -     | 55    | -            | 93    | -     | -     | -            | -     | -     | -     | -            | -     | -     |  |                       |  |  |  |                        |  |  |  |
|                         |                     |                 |       | Internal                      | -     | -     | 39    | -                                                | 36    | -     | 44    | -                           | -     | -     | 35    | -             | 37    | -     | 35    | -            | 93    | -     | -     | -            | -     | -     | -     | -            | -     | -     |  |                       |  |  |  |                        |  |  |  |
| 5                       | 240BTCSE005         | PIYUSH CHOUBEY  | 7.905 | EP                            | -     | -     | 81    | A                                                | 83    | A     | 77    | A                           | -     | -     | 90    | A+            | 74    | B+    | 60    | B            | 78    | A     | -     | -            | -     | -     | -     | -            | -     | -     |  |                       |  |  |  |                        |  |  |  |
|                         |                     |                 |       | External                      | -     | -     | 49    | -                                                | 47    | -     | 46    | -                           | -     | -     | 55    | -             | 47    | -     | 31    | -            | -     | -     | -     | -            | -     | -     | -     | -            | -     | -     |  |                       |  |  |  |                        |  |  |  |
|                         |                     |                 |       | Internal                      | -     | -     | 32    | -                                                | 36    | -     | 30.5  | -                           | -     | -     | 35    | -             | 27    | -     | 29    | -            | 78    | -     | -     | -            | -     | -     | -     | -            | -     | -     |  |                       |  |  |  |                        |  |  |  |
| 6                       | 240BTCSE006         | SAARA TEWATHIA  | 8.095 | EP                            | -     | -     | 76    | A                                                | 83    | A     | 70    | B+                          | -     | -     | 90    | A+            | 92    | A+    | 84    | A            | 94    | A+    | -     | -            | -     | -     | -     | -            | -     | -     |  |                       |  |  |  |                        |  |  |  |
|                         |                     |                 |       | External                      | -     | -     | 45    | -                                                | 48    | -     | 44    | -                           | -     | -     | 56    | -             | 36    | -     | 48    | -            | 94    | -     | -     | -            | -     | -     | -     | -            | -     | -     |  |                       |  |  |  |                        |  |  |  |
|                         |                     |                 |       | Internal                      | -     | -     | 31    | -                                                | 35    | -     | 36    | -                           | -     | -     | 34    | -             | 52    | -     | 36    | -            | 94    | -     | -     | -            | -     | -     | -     | -            | -     | -     |  |                       |  |  |  |                        |  |  |  |
| 7                       | 240BTCSE007         | AKSHAT SHUKLA   | 7.476 | EP                            | 79    | A     | -     | -                                                | 83    | A     | 68    | A+                          | 74    | B+    | -     | -             | 84    | A     | 78    | A            | 92    | A+    | -     | -            | -     | -     | -     | -            | -     | -     |  |                       |  |  |  |                        |  |  |  |
|                         |                     |                 |       | External                      | 49    | -     | -     | -                                                | 49    | -     | 38    | -                           | 44    | -     | -     | -             | 52    | -     | 45    | -            | -     | -     | -     | -            | -     | -     | -     | -            | -     | -     |  |                       |  |  |  |                        |  |  |  |
|                         |                     |                 |       | Internal                      | 30    | -     | -     | -                                                | 34    | -     | 30    | -                           | 30    | -     | -     | -             | 32    | -     | 33    | -            | 92    | -     | -     | -            | -     | -     | -     | -            | -     | -     |  |                       |  |  |  |                        |  |  |  |
| 8                       | 240BTCSE008         | ASTIK GUPTA     | 7.905 | EP                            | 62    | B     | -     | -                                                | 81    | A     | 77    | A                           | 88    | A+    | -     | -             | 85    | A+    | 69    | B            | 93    | A+    | -     | -            | -     | -     | -     | -            | -     | -     |  |                       |  |  |  |                        |  |  |  |
|                         |                     |                 |       | External                      | 36    | -     | -     | -                                                | 45    | -     | 43    | -                           | 55    | -     | -     | -             | 53    | -     | 42    | -            | -     | -     | -     | -            | -     | -     | -     | -            | -     | -     |  |                       |  |  |  |                        |  |  |  |
|                         |                     |                 |       | Internal                      | 26    | -     | -     | -                                                | 36    | -     | 34    | -                           | 33    | -     | -     | -             | 32    | -     | 27    | -            | 93    | -     | -     | -            | -     | -     | -     | -            | -     | -     |  |                       |  |  |  |                        |  |  |  |
| 9                       | 240BTCSE009         | AVESHA GUPTA    | 8.952 | EP                            | 85    | A+    | -     | -                                                | 88    | A+    | 80    | A                           | 97    | O     | -     | -             | 88    | A+    | 84    | A            | 92    | A+    | -     | -            | -     | -     | -     | -            | -     | -     |  |                       |  |  |  |                        |  |  |  |
|                         |                     |                 |       | External                      | 45    | -     | -     | -                                                | 51    | -     | 42    | -                           | 60    | -     | -     | -             | 54    | -     | 45    | -            | -     | -     | -     | -            | -     | -     | -     | -            | -     | -     |  |                       |  |  |  |                        |  |  |  |
|                         |                     |                 |       | Internal                      | 39.5  | -     | -     | -                                                | 37    | -     | 37.5  | -                           | 37    | -     | -     | -             | 34    | -     | 39    | -            | 92    | -     | -     | -            | -     | -     | -     | -            | -     | -     |  |                       |  |  |  |                        |  |  |  |

UFM

Prepared By: *S. K. Singh*

Page 1 of 12

Controller of Examinations

*16/11/25*

**SUSHANT UNIVERSITY, SECTOR-55, GURGAON**  
**End Semester Examination: Regular (December, 2024)**  
**B.Tech - CSE- Semester-1**

Prepared By: S. hussain

|                       |       |
|-----------------------|-------|
| Legend                | Total |
| EP : Absent           |       |
| DS : Deceased         |       |
| DR : Deferred         |       |
| UPM : Under Means     |       |
| Pass with Grace Marks |       |

**SUSHANT UNIVERSITY, SECTOR-55, GURGAON**  
**End Semester Examination: Regular (December, 2024)**  
**B. Tech - CSE- Semester-1**

| Sub Code                |                     | 23BTC-0ED11C                  | 23BTC-0EE11C                                     | 23BTC-0PI11C                | 23BTC-0MA11C  | 23BTC-0PV11C | 23BTC-0WS11C | 24BTC-0PY11C | EV52111               | SE151                  |       |       |
|-------------------------|---------------------|-------------------------------|--------------------------------------------------|-----------------------------|---------------|--------------|--------------|--------------|-----------------------|------------------------|-------|-------|
| Subject Name            |                     | Engineering Graphics & Design | Basics of Electronics and Electrical Engineering | Introduction to Programming | Mathematics-I | Physics      | Workshop     | Python       | Environmental Studies | Universal Human Values |       |       |
| Total Credit Point (21) |                     | 3                             | 5                                                | 4                           | 4             | 5            | 3            | 1            | 2                     | 2                      |       |       |
| S.No                    | Student Roll Number | Student Name                  | SGPA                                             | Exam Name                   | Marks         | Grade        | Marks        | Grade        | Marks                 | Grade                  | Marks | Grade |
| 19                      | 240BTCSE020         | AASHI THAKRAN                 | 5.905                                            | EP                          | 69            | B            | 56           | C            | 42                    | D                      | 93    | A+    |
|                         |                     |                               |                                                  | External                    | 34            |              | 30           |              | 15                    |                        | 20    |       |
|                         |                     |                               |                                                  | Internal                    | 35            |              | 26           |              | 27                    |                        | 24    |       |
| 20                      | 240BTCSE021         | NIKHIL PATEL                  | 7.143                                            | EP                          | -             | -            | 54           | C            | 70                    | B+                     | 84    | A     |
|                         |                     |                               |                                                  | External                    | -             |              | 28           |              | 42                    |                        | 48    |       |
|                         |                     |                               |                                                  | Internal                    | -             |              | 26           |              | 36.5                  |                        | 36    |       |
| 21                      | 240BTCSE022         | DHRUV YADAV                   | 2.857                                            | EP                          | 45            | D            | 35           | F            | 26                    | F                      | 51    | C     |
|                         |                     |                               |                                                  | External                    | 30            |              | 19           |              | 4                     |                        | 19    |       |
|                         |                     |                               |                                                  | Internal                    | 15            |              | 16           |              | 21.5                  |                        | 32    |       |
| 22                      | 240BTCSE023         | ARPIT KUMAR                   | 5.571                                            | EP                          | 57            | C            | 60           | B            | 40.00                 | D                      | 51    | C     |
|                         |                     |                               |                                                  | External                    | 32            |              | 35           |              | 11                    |                        | 26    |       |
|                         |                     |                               |                                                  | Internal                    | 25            |              | 25           |              | 27                    |                        | 25    |       |
| 23                      | 240BTCSE024         | PALAK SHRIVASTAV              |                                                  | EP                          | -             | -            | -            | -            | -                     | -                      | -     | -     |
|                         |                     |                               |                                                  | External                    | -             |              | -            |              | -                     |                        | -     |       |
|                         |                     |                               |                                                  | Internal                    | -             |              | -            |              | -                     |                        | -     |       |
| 24                      | 240BTCSE025         | NAKSH KUMAR                   | 6.048                                            | EP                          | -             | -            | 54           | C            | 66                    | B                      | 42    | D     |
|                         |                     |                               |                                                  | External                    | -             |              | 27           |              | 42                    |                        | 16    |       |
|                         |                     |                               |                                                  | Internal                    | -             |              | 24           |              | 25.5                  |                        | -     |       |
| 25                      | 240BTCSE026         | HARSHIT CHHILLAR              | 5.476                                            | EP                          | 43            | D            | 55           | C            | 53                    | C                      | 61    | B     |
|                         |                     |                               |                                                  | External                    | 33            |              | 33           |              | 26                    |                        | 37    |       |
|                         |                     |                               |                                                  | Internal                    | 10            |              | 22           |              | 27                    |                        | 24    |       |
| 26                      | 240BTCSE028         | PRASHANT SHARMA               | 7.619                                            | EP                          | -             | -            | 70           | B+           | 84                    | A                      | 63    | B     |
|                         |                     |                               |                                                  | External                    | -             |              | 37           |              | 48                    |                        | 92    | A+    |
|                         |                     |                               |                                                  | Internal                    | -             |              | 33           |              | 36                    |                        | 56    |       |
| 27                      | 240BTCSE029         | AARTI NEGI                    | 9.286                                            | EP                          | 97            | O            | 92           | A+           | 81                    | A                      | 100   | O     |
|                         |                     |                               |                                                  | External                    | 58            |              | 55           |              | 45                    |                        | 60    |       |
|                         |                     |                               |                                                  | Internal                    | 39            |              | 37           |              | 36                    |                        | 40    |       |

Result Withheld\*

**Result Withheld\***

Prepared By: *S. K. Singh*

Page 3 of 12

Controller of Examinations



*Signature*  
16/12/25

**SUSHANT UNIVERSITY, SECTOR-55, GURGAON**  
**End Semester Examination: Regular (December, 2024),**  
**B.Tech - CSE- Semester-1**

Prepared By: S. K. Singh

|                       |
|-----------------------|
| Legend                |
| EP: Total             |
| AB: Absent            |
| OB: Obsolete          |
| DE: Deferred          |
| UFM: Unfair Means     |
| Plus with Grace Marks |

**SUSHANT UNIVERSITY, SECTOR-55, GURGAON**  
**End Semester Examination: Regular (December, 2024)**  
**B.Tech - CSE - Semester-1**

| Sub Code                |                     |                     | 23BTC-0ED11C                  | 23BTC-0EE11C                                     | 23BTC-0PI11C                | 23BTC-0MA11C  | 23BTC-0PY11C | 23BTC-0WS11C | 24BTC-0PY11C | EV52111               | SE151                  |       |
|-------------------------|---------------------|---------------------|-------------------------------|--------------------------------------------------|-----------------------------|---------------|--------------|--------------|--------------|-----------------------|------------------------|-------|
| Subject Name            |                     |                     | Engineering Graphics & Design | Basics of Electronics and Electrical Engineering | Introduction to Programming | Mathematics-I | Physics      | Workshop     | Python       | Environmental Studies | Universal Human Values |       |
| Total Credit Point (21) |                     |                     | 3                             | 5                                                | 4                           | 4             | 5            | 3            | 1            | 2                     | 2                      |       |
| S.No                    | Student Roll Number | Student Name        | SGPA                          | Exam Name                                        | Marks                       | Grade         | Marks        | Grade        | Marks        | Grade                 | Marks                  | Grade |
| 37                      | 240BTCSE039         | SUJANI GUPTA        | 8.286                         | EP                                               | -                           | -             | 83           | A            | 81           | A                     | 80                     | A     |
|                         |                     |                     |                               | External                                         | -                           | -             | 51           | -            | 45           | -                     | 43                     | -     |
|                         |                     |                     |                               | Internal                                         | -                           | -             | 32           | -            | 36           | -                     | 37                     | -     |
| 38                      | 240BTCSE040         | SARITAK MEHTA       | 5.667                         | EP                                               | -                           | -             | 52           | C            | 52           | C                     | 51                     | B     |
|                         |                     |                     |                               | External                                         | -                           | -             | 31           | -            | 29           | -                     | 35                     | -     |
|                         |                     |                     |                               | Internal                                         | -                           | -             | 21           | -            | 23           | -                     | 26                     | -     |
| 39                      | 240BTCSE041         | BHAVIK CHAWLA       | 4.143                         | EP                                               | 49                          | D             | 57           | C            | 57           | C                     | 52                     | C     |
|                         |                     |                     |                               | External                                         | 28                          | -             | 33           | -            | 33           | -                     | 26                     | -     |
|                         |                     |                     |                               | Internal                                         | 21                          | -             | 24           | -            | 24           | -                     | 20                     | -     |
| 40                      | 240BTCSE042         | KANISHKA YADAV      | 7.429                         | EP                                               | 71                          | B+            | 81           | A            | 81           | A                     | 71                     | C     |
|                         |                     |                     |                               | External                                         | 40                          | -             | 47           | -            | 47           | -                     | 26                     | -     |
|                         |                     |                     |                               | Internal                                         | 31                          | -             | 34           | -            | 34           | -                     | 32                     | -     |
| 41                      | 240BTCSE043         | ARAV                | 5.810                         | EP                                               | 70                          | B+            | 59           | C            | 59           | C                     | 52                     | C     |
|                         |                     |                     |                               | External                                         | 43                          | -             | 30           | -            | 30           | -                     | 24                     | -     |
|                         |                     |                     |                               | Internal                                         | 27                          | -             | 29           | -            | 29           | -                     | 28                     | -     |
| 42                      | 240BTCSE044         | FAIZAN KHAN         |                               | EP                                               | -                           | -             | -            | -            | -            | -                     | -                      | -     |
|                         |                     |                     |                               | External                                         | -                           | -             | -            | -            | -            | -                     | -                      | -     |
|                         |                     |                     |                               | Internal                                         | -                           | -             | -            | -            | -            | -                     | -                      | -     |
| 43                      | 240BTCSE046         | KVATHIKA RAO SEELAM | 9.571                         | EP                                               | 96                          | O             | 96           | O            | 94           | A+                    | 97                     | O     |
|                         |                     |                     |                               | External                                         | 57                          | -             | 56           | -            | 55           | -                     | 60                     | -     |
|                         |                     |                     |                               | Internal                                         | 39                          | -             | 40           | -            | 38.5         | -                     | 37                     | -     |
| 44                      | 240BTCSE047         | ASHISH KUMAR SHARMA | 7.476                         | EP                                               | 67                          | B             | 78           | A            | 69           | 8                     | 94                     | A+    |
|                         |                     |                     |                               | External                                         | 42                          | -             | 45           | -            | 45           | -                     | 36                     | -     |
|                         |                     |                     |                               | Internal                                         | 25                          | -             | 33           | -            | 32.5         | -                     | 54                     | -     |
| 45                      | 240BTCSE048         | PANINEETA           | 6.000                         | EP                                               | -                           | -             | 46           | D            | 64           | 8                     | 55                     | C     |
|                         |                     |                     |                               | External                                         | -                           | -             | 27           | -            | 37           | -                     | 29                     | -     |
|                         |                     |                     |                               | Internal                                         | -                           | -             | 19           | -            | 27           | -                     | 25.5                   | -     |
| Result withheld*        |                     |                     |                               |                                                  |                             |               |              |              |              |                       |                        |       |

**Result Withheld\***

Prepared By: *S. K. Bhatia*

*16/11/25*  
 Controller of Examinations



Legend  
 EP : Total  
 AS : Absent  
 OS : Ouberted  
 DE : Deferred  
 UFM : Under Means  
 Pass with Grade Mark

**SUSHANT UNIVERSITY, SECTOR-55, GURGAON**  
**End Semester Examination: Regular (December, 2024)**  
**B.Tech - CSE - Semester-1**

| Sub Code                |                     | 23BTC-0ED11C                  | 23BTC-0EE11C                                     | 23BTC-0IP11C                | 23BTC-0MA11C  | 23BTC-0PV11C | 23BTC-0WS11C | 24BTC-0PY11C | EV52111               | SE151                  |       |       |
|-------------------------|---------------------|-------------------------------|--------------------------------------------------|-----------------------------|---------------|--------------|--------------|--------------|-----------------------|------------------------|-------|-------|
| Subject Name            |                     | Engineering Graphics & Design | Basics of Electronics and Electrical Engineering | Introduction to Programming | Mathematics-I | Physics      | Workshop     | Python       | Environmental Studies | Universal Human Values |       |       |
| Total Credit Point (21) |                     | 3                             | 5                                                | 4                           | 4             | 5            | 3            | 1            | 2                     | 2                      |       |       |
| S.No                    | Student Roll Number | Student Name                  | SGPA                                             | Exam Name                   | Marks         | Grade        | Marks        | Grade        | Marks                 | Grade                  | Marks | Grade |
| 46                      | 240BTCCE049         | TANISHKA GUPTA                | 8.238                                            | EP                          | -             | -            | 77           | A            | 78                    | A                      | 84    | A     |
|                         |                     |                               |                                                  | External                    | -             | -            | 49           | -            | 48                    | -                      | -     | -     |
|                         |                     |                               |                                                  | Internal                    | -             | -            | 28           | -            | 30                    | -                      | 91    | A+    |
| 47                      | 240BTCCE050         | KUNAL JOON                    | 8.381                                            | EP                          | 82            | A            | -            | -            | 83                    | A                      | 93    | A+    |
|                         |                     |                               |                                                  | External                    | 47            | -            | -            | -            | 49                    | -                      | 43    | -     |
|                         |                     |                               |                                                  | Internal                    | 35            | -            | -            | -            | 34                    | -                      | 40    | -     |
| 48                      | 240BTCCE051         | MAYANK RATHORE                | 5.952                                            | EP                          | 53            | C            | -            | -            | 68                    | B                      | 93    | A+    |
|                         |                     |                               |                                                  | External                    | 37            | -            | -            | -            | 46                    | -                      | 59    | C     |
|                         |                     |                               |                                                  | Internal                    | 16            | -            | -            | -            | 22                    | -                      | 32    | -     |
| 49                      | 240BTCCE052         | RITESH MAAN                   | 6.333                                            | EP                          | -             | -            | 54           | C            | 58                    | C                      | 72    | B+    |
|                         |                     |                               |                                                  | External                    | -             | -            | 34           | -            | 33                    | -                      | 72    | B+    |
|                         |                     |                               |                                                  | Internal                    | -             | -            | 20           | -            | 25                    | -                      | 93    | A+    |
| 50                      | 240BTCCE053         | ASHANK SHARMA                 |                                                  | EP                          | -             | -            | -            | -            | 32.5                  | -                      | -     | -     |
|                         |                     |                               |                                                  | External                    | -             | -            | -            | -            | -                     | -                      | -     | -     |
|                         |                     |                               |                                                  | Internal                    | -             | -            | -            | -            | -                     | -                      | -     | -     |
| 51                      | 240BTCCE054         | ADARSH                        | 6.333                                            | EP                          | -             | -            | 53           | C            | 70                    | B+                     | 76    | A     |
|                         |                     |                               |                                                  | External                    | -             | -            | 26           | -            | 43                    | -                      | 64    | B     |
|                         |                     |                               |                                                  | Internal                    | -             | -            | 27           | -            | 27                    | -                      | 42    | -     |
| 52                      | 240BTCCE055         | KUNAL ARYAN                   | 5.667                                            | EP                          | -             | -            | 56           | C            | 70                    | B+                     | 50    | -     |
|                         |                     |                               |                                                  | External                    | -             | -            | 34           | -            | 45                    | -                      | 26    | -     |
|                         |                     |                               |                                                  | Internal                    | -             | -            | 22           | -            | 25                    | -                      | 62    | B     |
| 53                      | 240BTCCE056         | SARTHAK PANDAY                | 6.429                                            | EP                          | 88            | A+           | -            | -            | 68                    | B                      | 40    | -     |
|                         |                     |                               |                                                  | External                    | 51            | -            | -            | -            | 40                    | -                      | 44    | -     |
|                         |                     |                               |                                                  | Internal                    | 37            | -            | -            | -            | 28                    | -                      | 24    | -     |
| 54                      | 240BTCCE057         | DIVYANSHU RANA                | 7.810                                            | EP                          | -             | -            | 73           | B+           | 81                    | A                      | 29    | -     |
|                         |                     |                               |                                                  | External                    | -             | -            | 38           | -            | 45                    | -                      | 78    | A     |
|                         |                     |                               |                                                  | Internal                    | -             | -            | 35           | -            | 36                    | -                      | 29    | -     |

Result Withheld\*

Result Withheld\*

Prepared By:

Page 6 of 12

Controller of Examinations

16/11/25

|                       |       |
|-----------------------|-------|
| Legend                | Total |
| EP: Absent            |       |
| DS: Deferred          |       |
| DE: Deferred          |       |
| UNM: Unfair Means     |       |
| Pass with Grace Marks |       |

**SUSHANT UNIVERSITY, SECTOR-55, GURGAON**  
**End Semester Examination: Regular (December, 2024)**  
**B.Tech - CSE - Semester-1**

| Sub Code                |                     |                       |       | 23BTC-0ED11C                  | 23BYC-0EE11C                                     | 23BTC-0IP11C                | 23BTC-0MA11C    | 23BTC-0PY11C | 23BTC-0WS11C | 24BTC-0PY11C | EV52111               | SE151                  |       |       |
|-------------------------|---------------------|-----------------------|-------|-------------------------------|--------------------------------------------------|-----------------------------|-----------------|--------------|--------------|--------------|-----------------------|------------------------|-------|-------|
| Subject Name            |                     |                       |       | Engineering Graphics & Design | Basics of Electronics and Electrical Engineering | Introduction to Programming | (Mathematics-I) | Physics      | Workshop     | Python       | Environmental Studies | Universal Human Values |       |       |
| Total Credit Point (21) |                     |                       |       | 3                             | 5                                                | 4                           | 4               | 5            | 3            | 1            | 2                     | 2                      |       |       |
| S.No                    | Student Roll Number | Student Name          | SGPA  | Exam Name                     | Marks                                            | Grade                       | Marks           | Grade        | Marks        | Grade        | Marks                 | Grade                  | Marks | Grade |
| 55                      | 240BTCCE058         | SANA GHOSH            |       | EP                            |                                                  |                             |                 |              |              |              |                       |                        |       |       |
|                         |                     |                       |       | External                      |                                                  |                             |                 |              |              |              |                       |                        |       |       |
|                         |                     |                       |       | Internal                      |                                                  |                             |                 |              |              |              |                       |                        |       |       |
| 56                      | 240BTCCE059         | ATHARV MALIK          |       | EP                            |                                                  |                             |                 |              |              |              |                       |                        |       |       |
|                         |                     |                       |       | External                      |                                                  |                             |                 |              |              |              |                       |                        |       |       |
|                         |                     |                       |       | Internal                      |                                                  |                             |                 |              |              |              |                       |                        |       |       |
| 57                      | 240BTCCE060         | RITESH KUMAR          | 5.857 | EP                            | -                                                | -                           | 48              | D            | 65           | B            | 49                    | D                      | -     | -     |
|                         |                     |                       |       | External                      | -                                                | -                           | 28              | -            | 40           | -            | 20                    | -                      | -     | -     |
|                         |                     |                       |       | Internal                      | -                                                | -                           | 20              | -            | 25           | -            | 28.5                  | -                      | -     | -     |
| 58                      | 240BTCCE061         | MOHAMOUD ALLAELEEN    | 3.000 | EP                            | -                                                | -                           | 33              | F            | 46           | D            | 30                    | F                      | -     | -     |
|                         |                     |                       |       | External                      | -                                                | -                           | 13              | -            | 30           | -            | 18                    | -                      | -     | -     |
|                         |                     |                       |       | Internal                      | -                                                | -                           | 20              | -            | 16           | -            | 22                    | -                      | -     | -     |
| 59                      | 240BTCCE062         | ARMAN SAIFI           | 7.857 | EP                            | 64                                               | B                           | -               | -            | 90           | A+           | 61                    | B                      | 92    | A+    |
|                         |                     |                       |       | External                      | 40                                               | -                           | -               | -            | 55           | -            | 26                    | -                      | -     | -     |
|                         |                     |                       |       | Internal                      | 24                                               | -                           | -               | -            | 35           | -            | 34.5                  | -                      | -     | -     |
| 60                      | 240BTCCE063         | ARYAN KUMAR           | 6.429 | EP                            | 61                                               | B                           | -               | -            | 76           | A            | 65                    | B                      | 52    | C     |
|                         |                     |                       |       | External                      | 25                                               | -                           | -               | -            | 42           | -            | 30                    | -                      | -     | -     |
|                         |                     |                       |       | Internal                      | 36                                               | -                           | -               | -            | 34           | -            | 35                    | -                      | -     | -     |
| 61                      | 240BTCCE064         | MOHAMED KHALID KHALID | 2.571 | EP                            | -                                                | -                           | 28              | F            | 41           | D            | 33                    | F                      | 29    | -     |
|                         |                     |                       |       | External                      | -                                                | -                           | 9               | -            | 27           | -            | 8                     | -                      | -     | -     |
|                         |                     |                       |       | Internal                      | -                                                | -                           | 19              | -            | 14           | -            | 24.5                  | -                      | -     | -     |
| 62                      | 240BTCCE065         | HARSH SHARMA          | 4.830 | EP                            | 7                                                | F                           | -               | -            | 50           | C            | 62                    | B                      | 52    | C     |
|                         |                     |                       |       | External                      | 7                                                | -                           | -               | -            | 29           | -            | 33                    | -                      | 26    | -     |
|                         |                     |                       |       | Internal                      | -                                                | -                           | -               | -            | 21           | -            | 29                    | -                      | 26    | -     |
| 63                      | 240BTCCE066         | GERMANI RAUSHIK       | 5.476 | EP                            | -                                                | -                           | 52              | C            | 67           | B            | 47                    | D                      | -     | -     |
|                         |                     |                       |       | External                      | -                                                | -                           | 26              | -            | 39           | -            | 26                    | -                      | 62    | B     |
|                         |                     |                       |       | Internal                      | -                                                | -                           | 26              | -            | 28           | -            | 23                    | -                      | 42    | -     |
|                         |                     |                       |       |                               |                                                  |                             |                 |              |              |              |                       |                        | 25    | 79    |
| Result Withheld*        |                     |                       |       |                               |                                                  |                             |                 |              |              |              |                       |                        |       |       |
| Result Withheld*        |                     |                       |       |                               |                                                  |                             |                 |              |              |              |                       |                        |       |       |

|                       |       |
|-----------------------|-------|
| Legend                | Total |
| EP: Total             |       |
| AB: Absent            |       |
| DB: Debarred          |       |
| DE: Deferred          |       |
| UFM: Unfair Means     |       |
| Pass with Grace Marks |       |

**SUSHANT UNIVERSITY, SECTOR-55, GURGAON**  
**End Semester Examination: Regular (December, 2024)**  
**B.Tech - CSE- Semester-1**

| Sub Code                |                     |                 | 23BTC-0ED11C                  | 23BTC-0EE11C                                     | 23BTC-0IP11C                | 23BTC-0MA11C  | 23BTC-0PY11C | 23BTC-0WS11C | 24BTC-0PY11C | EVS2111               | SE151                  |       |
|-------------------------|---------------------|-----------------|-------------------------------|--------------------------------------------------|-----------------------------|---------------|--------------|--------------|--------------|-----------------------|------------------------|-------|
| Subject Name            |                     |                 | Engineering Graphics & Design | Basics of Electronics and Electrical Engineering | Introduction to Programming | Mathematics-I | Physics      | Workshop     | Python       | Environmental Studies | Universal Human Values |       |
| Total Credit Point (21) |                     |                 | 3                             | 5                                                | 4                           | 4             | 5            | 3            | 1            | 2                     | 2                      |       |
| S.No                    | Student Roll Number | Student Name    | SGPA                          | Exam Name                                        | Marks                       | Grade         | Marks        | Grade        | Marks        | Grade                 | Marks                  | Grade |
| 64                      | 240BTCCE067         | UNNATI          | 8.286                         | EP                                               | -                           | -             | 80           | A            | 85           | A+                    | 73                     | B+    |
|                         |                     |                 |                               | External                                         | -                           | -             | 46           | -            | 50           | -                     | 42                     | -     |
|                         |                     |                 |                               | Internal                                         | -                           | -             | 34           | -            | 35           | -                     | 31                     | -     |
| 65                      | 240BTCCE068         | YASHRAJ KAUSHIK | 0.000                         | EP                                               | -                           | -             | 0            | F            | 0            | F                     | 0                      | F     |
|                         |                     |                 |                               | External                                         | -                           | -             | DB           | -            | DB           | -                     | DB                     | -     |
|                         |                     |                 |                               | Internal                                         | -                           | -             | 0            | -            | 0            | -                     | 0                      | -     |
| 66                      | 240BTCCE069         | KRISHNA GEMINI  | 6.000                         | EP                                               | 63                          | B             | 0            | -            | 64           | B                     | 71                     | B+    |
|                         |                     |                 |                               | External                                         | 36                          | -             | 42           | -            | 42           | -                     | 41                     | -     |
|                         |                     |                 |                               | Internal                                         | 27                          | -             | 22           | -            | 28.5         | -                     | 21                     | -     |
| 67                      | 240BTCCE070         | MAYANK SHARMA   | 8.905                         | EP                                               | 92                          | A+            | 86           | A+           | 90           | A+                    | 94                     | A+    |
|                         |                     |                 |                               | External                                         | 53                          | -             | 50           | -            | 56           | -                     | 58                     | -     |
|                         |                     |                 |                               | Internal                                         | 39                          | -             | 36           | -            | 33.5         | -                     | 36                     | -     |
| 68                      | 240BTCCE071         | PRAGYA          |                               | EP                                               | -                           | -             | -            | -            | -            | -                     | -                      | -     |
|                         |                     |                 |                               | External                                         | -                           | -             | -            | -            | -            | -                     | -                      | -     |
|                         |                     |                 |                               | Internal                                         | -                           | -             | -            | -            | -            | -                     | -                      | -     |
| 69                      | 240BTCCE074         | SANJEEV KUMAR   | 6.905                         | EP                                               | 69                          | B             | 71           | B+           | 69           | B                     | 76                     | A     |
|                         |                     |                 |                               | External                                         | 44                          | -             | 45           | -            | 33           | -                     | 52                     | -     |
|                         |                     |                 |                               | Internal                                         | 25                          | -             | 26           | -            | 29.5         | -                     | 24                     | -     |
| 70                      | 240BTCCE075         | TANIYA MALIK    | 8.361                         | EP                                               | -                           | -             | 75           | A            | 77           | A                     | 81                     | A     |
|                         |                     |                 |                               | External                                         | -                           | -             | 42           | -            | 45           | -                     | 44                     | -     |
|                         |                     |                 |                               | Internal                                         | -                           | -             | 33           | -            | 32           | -                     | 37                     | -     |
| 71                      | 240BTCCE076         | POORAV YADAV    |                               | EP                                               | -                           | -             | -            | -            | -            | -                     | -                      | -     |
|                         |                     |                 |                               | External                                         | -                           | -             | -            | -            | -            | -                     | -                      | -     |
|                         |                     |                 |                               | Internal                                         | -                           | -             | -            | -            | -            | -                     | -                      | -     |
| 72                      | 240BTCCE077         | ANUPRYA         | 8.619                         | EP                                               | 86                          | A+            | 84           | A            | 77           | A                     | 90                     | A+    |
|                         |                     |                 |                               | External                                         | 50                          | -             | 49           | -            | 40           | -                     | 55                     | -     |
|                         |                     |                 |                               | Internal                                         | 36                          | -             | 35           | -            | 37           | -                     | 35                     | -     |
| Result Witthield*       |                     |                 |                               |                                                  |                             |               |              |              |              |                       |                        |       |
| Result Witthield*       |                     |                 |                               |                                                  |                             |               |              |              |              |                       |                        |       |

**Result Withheld\***

**Result Withheld\***

Prepared By: *S. K. Singh*

| Legend                |
|-----------------------|
| EP: Total             |
| AB: Absent            |
| DB: Deferred          |
| DE: Deferred          |
| UFM: Under Marks      |
| Pass With Grace Marks |

**SUSHANT UNIVERSITY, SECTOR-55, GURGAON**  
**End Semester Examination: Regular (December, 2024)**  
**B.Tech - CSE- Semester-1**

| Sub Code                |                     |                   | 23BTC-0ED11C                  | 23BTC-0EE11C                                     | 23BTC-0IP11C                | 23BTC-0MA11T  | 23BTC-0PY11C | 23BTC-0WS11C | 24BTC-0PY11C | EV52111               | SE151                  |       |
|-------------------------|---------------------|-------------------|-------------------------------|--------------------------------------------------|-----------------------------|---------------|--------------|--------------|--------------|-----------------------|------------------------|-------|
| Subject Name            |                     |                   | Engineering Graphics & Design | Basics of Electronics and Electrical Engineering | Introduction to Programming | Mathematics-I | Physics      | Workshop     | Python       | Environmental Studies | Universal Human Values |       |
| Total Credit Point (21) |                     |                   | 3                             | 5                                                | 4                           | 4             | 5            | 3            | 1            | 2                     | 2                      |       |
| S.No                    | Student Roll Number | Student Name      | SGPA                          | Exam Name                                        | Marks                       | Grade         | Marks        | Grade        | Marks        | Grade                 | Marks                  | Grade |
| 73                      | 240BTCCE078         | KAUSHAL YADAV     | 8.143                         | EP                                               | 82                          | A             | 81           | A            | 77           | A                     | 94                     | A+    |
|                         |                     |                   |                               | External                                         | 44                          |               | 45           |              | 44           |                       | 60                     |       |
|                         |                     |                   |                               | Internal                                         | 38                          |               | 36           |              | 32.5         |                       | 34                     |       |
| 74                      | 240BTCCE079         | AKSHIT MATTHUR    | 7.476                         | EP                                               | 63                          | B             | 82           | A            | 63           | B                     | 90                     | A+    |
|                         |                     |                   |                               | External                                         | 30                          |               | 48           |              | 33           |                       | 60                     |       |
|                         |                     |                   |                               | Internal                                         | 33                          |               | 34           |              | 29.5         |                       | 30                     |       |
| 75                      | 240BTCCE080         | DEEKSHA SORAI     | 6.667                         | EP                                               | -                           | -             | 75           | A            | 58           | C                     | -                      | -     |
|                         |                     |                   |                               | External                                         | -                           |               | 45           |              | 31           |                       | 80                     |       |
|                         |                     |                   |                               | Internal                                         | -                           |               | 30           |              | 27           |                       | 50                     |       |
| 76                      | 240BTCCE081         | ANKIT NAGAR       | 2.762                         | EP                                               | 19                          | F             | 29           | F            | 23           | F                     | 53                     | C     |
|                         |                     |                   |                               | External                                         | 15                          |               | 16           |              | 3            |                       | 28                     |       |
|                         |                     |                   |                               | Internal                                         | 4                           |               | 13           |              | 20           |                       | 25                     |       |
| 77                      | 240BTCCE083         | VIRIN SINGH YADAV | 5.667                         | EP                                               | 63                          | B             | 59           | C            | 60.00        | D                     | 61                     | B     |
|                         |                     |                   |                               | External                                         | 32                          |               | 37           |              | 17           |                       | 33                     |       |
|                         |                     |                   |                               | Internal                                         | 31                          |               | 22           |              | 22           |                       | 28                     |       |
| 78                      | 240BTCCE084         | SHIV KUMAR RAY    | 7.381                         | EP                                               | 74                          | B+            | 78           | A            | 69           | B                     | 84                     | A     |
|                         |                     |                   |                               | External                                         | 46                          |               | 48           |              | 37           |                       | 52                     |       |
|                         |                     |                   |                               | Internal                                         | 28                          |               | 30           |              | 31.5         |                       | 32                     |       |
| 79                      | 240BTCCE085         | MOHD HAMZA        | 6.667                         | EP                                               | -                           | -             | 73           | B+           | 56           | C                     | -                      | -     |
|                         |                     |                   |                               | External                                         | -                           |               | 44           |              | 27           |                       | 90                     |       |
|                         |                     |                   |                               | Internal                                         | -                           |               | 29           |              | 26.5         |                       | 55                     |       |
| 80                      | 240BTCCE086         | SAMEER PAMWA      | 5.762                         | EP                                               | -                           | -             | 56           | C            | 55           | C                     | -                      | -     |
|                         |                     |                   |                               | External                                         | -                           |               | 29           |              | 30           |                       | 78                     |       |
|                         |                     |                   |                               | Internal                                         | -                           |               | 27           |              | 25           |                       | 48                     |       |
| 81                      | 240BTCCE087         | ABHINAV RANGA     | 5.429                         | EP                                               | 45                          | D             | 51           | C            | 53           | C                     | 57                     | C     |
|                         |                     |                   |                               | External                                         | 25                          |               | 28           |              | 25           |                       | 42                     |       |
|                         |                     |                   |                               | Internal                                         | 20                          |               | 23           |              | 28           |                       | 15                     |       |

Prepared By: *S. Sridhar*

**SUSHANT UNIVERSITY, SECTOR-55, GURGAON**  
**End Semester Examination: Regular (December, 2024)**  
**B.Tech - CSE -Semester-1**

Prepared By: S. Smith