Roll No											

PRESIDENCY UNIVERSITY
BENGALURU

SCHOOL OF ENGINEERING
MID TERM EXAMINATION - OCT 2023

Semester : Semester I - 2023
Course Code : MAT1001
Course Name : Sem I - MAT1001 - Calculus and Linear Algebra
Program : B.Tech.

Date : 30-OCT-2023
Time : 9:30 AM - 11:00 AM
Max Marks : 50
Weightage : 50%

Instructions:
(i) Read all questions carefully and answer accordingly.
(ii) Question paper consists of 3 parts.
(iii) Scientific and non-programmable calculator are permitted.
(iv) Do not write any information on the question paper other than Roll Number.

PART A

ANSWER ALL THE QUESTIONS **(5 X 2 = 10M)**

1. Find the eigenvalues of the matrices A and A^T where $A = \begin{pmatrix} 3 & 1 & 4 \\ 0 & 2 & 6 \\ 0 & 0 & 5 \end{pmatrix}$. (CO1) [Knowledge]

2. What is an upper triangular matrix? Give an example. (CO1) [Knowledge]

3. If $A = \begin{pmatrix} -3 & 8 \\ -2 & 7 \end{pmatrix}$, then find the eigenvalues of A. (CO1) [Knowledge]

4. State any two applications of Cayley-Hamilton theorem. (CO1) [Knowledge]

5. Define a homogeneous function of two variables. (CO2) [Knowledge]

PART B

ANSWER ALL THE QUESTIONS **(4 X 5 = 20M)**

6. Find all the eigenvalues of the matrix $A = \begin{bmatrix} 6 & -2 & 2 \\ -2 & 3 & -1 \\ 2 & -1 & 3 \end{bmatrix}$. (CO1) [Comprehension]

7. The product of two eigenvalues of the matrix $A = \begin{bmatrix} 6 & -2 & 2 \\ -2 & 3 & -1 \\ 2 & -1 & 3 \end{bmatrix}$ is 16. Find the third eigenvalue.

(CO1) [Comprehension]

8. Verify Cayley-Hamilton theorem for the matrix $\begin{bmatrix} 1 & 1 & 3 \\ 1 & 5 & 1 \\ 3 & 1 & 1 \end{bmatrix}$.

(CO1) [Comprehension]

9. Show that $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} = 2tanu$ using Euler's theorem where $u = \cos^{-1}(x^2 + y^2)$.

(CO2) [Comprehension]

PART C

ANSWER THE FOLLOWING QUESTION **(1 X 20 = 20M)**

10. Find all the eigenvalues and the corresponding eigenvectors of the matrix $\begin{bmatrix} 7 & -2 & 0 \\ -2 & 6 & -2 \\ 0 & -2 & 5 \end{bmatrix}$.

(CO1) [Application]