Roll No											

PRESIDENCY UNIVERSITY
BENGALURU

SET B

SCHOOL OF ENGINEERING
MID TERM EXAMINATION - DEC 2023

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

Date : 8-DEC-2023
Time : 2:30PM - 4:00PM
Max Marks : 50
Weightage : 25%

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. Two eigen values of matrix $A = \begin{bmatrix} 2 & -1 & 3 \\ 0 & 5 & 2 \\ 0 & 0 & -2 \end{bmatrix}$ are 2 and 5. Then find the third eigen value of the given matrix.

(CO1) [Knowledge]

2. Write the characteristic equation for a *3×3* matrix.

(CO1) [Knowledge]

3. if $A = \begin{pmatrix} -1 & 2 \\ 2 & -1 \end{pmatrix}$, then find the eigenvalues of the matrix A.

(CO1) [Knowledge]

4. If $\lambda^2 - 5\lambda = 0$ is the characteristic equation for the matrix $A = \begin{bmatrix} 1 & 2 \\ 2 & 4 \end{bmatrix}$ then apply Cayley Hamilton theorem.

(CO1) [Knowledge]

5. Write the statement of Euler's extension theorem on homogeneous functions of degree n.

(CO2) [Knowledge]

PART B

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

6. Find the eigenvalues $\begin{bmatrix} 1 & 1 & 1 \\ -1 & -3 & -3 \\ 2 & 4 & 4 \end{bmatrix}$.

(CO1) [Comprehension]

7. Show that the Eigenvalues of the real symmetric matrix $A = \begin{bmatrix} -2 & 2 \\ 2 & 1 \end{bmatrix}$ are real.

(CO1) [Comprehension]

8. If $A = \begin{bmatrix} 1 & 1 & 3 \\ 1 & 5 & 1 \\ 3 & 1 & 1 \end{bmatrix}$, find its A^{-1} using Cayley-Hamilton theorem

(CO1) [Comprehension]

9. Prove that for the function $u(x,y) = sin^{-1}\left(\frac{x+y}{\sqrt{x}+\sqrt{y}}\right)$ is $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} = \frac{1}{2}tanu.$

(CO2) [Comprehension]

PART C

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

10. Find the eigen values and eigen vectors of the matrix B= $\begin{bmatrix} 1 & -1 & 4 \\ 3 & 2 & -1 \\ 2 & 1 & -1 \end{bmatrix}$

(CO1) [Application]