Enrollment No: COM24028

FACULTY OF ENGINEERING

B.E. Sem - I Mid Semester Examination Winter-2024

Subject Name: Mathematics 1 **Date: 21/10/24**

Subject Code: 2010200102

Total Marks: 40 **Time: 1:30 PM – 3:00PM**

Instructions:

1. Attempt any FOUR questions out of FIVE questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

Q.1 Answer the following.

(A) State Cayley-Hamilton Theorem (2)

(B). Find Eigen value and Eigen vector of the matrix $A=\begin{bmatrix} 1 & 3 \\ -2 & 6 \end{bmatrix}$ (3)

(C) Find the Inverse Of the Matrices by Gauss- Jordan Method $A=\begin{bmatrix} 1 & 2 & 3 \\ 2 & 5 & 3 \\ 1 & 0 & 8 \end{bmatrix}$. (5)

Q.2 Answer the following.

(A) Give the Maclaurin's Series for function $f(x)=e^x$ (2)

(B) Find $\sqrt{9.12}$ using Taylor's series (3)

(C) Find $\lim_{x\to 0} \frac{e^x + e^{-x} - x^2 - 2}{\sin^2 x - x^2}$ (5)

Q.3 Answer the following.

(A) Find rank of matrix $A=\begin{bmatrix} 2 & 3 \\ 4 & 6 \end{bmatrix}$.

(B) Show that $A=\begin{bmatrix} 1 & 0 & 0 \\ 1 & 2 & 0 \\ -3 & 5 & 2 \end{bmatrix}$ is not diagonalizable.

(C) Solve the system by gauss elimination method

$x - y + z = 3,\ 2x - 3y + 5z = 10,\ x + y + 4z = 4$

Q.4 Answer the following.

(A) State L'Hospital Rule

(B) Find the nth derivative of $y=x^3e^{ax}$

(C) Expand $49+69x+42x^2+11x^3+x^4$ in powers of $(x+5)$

Q.5 Answer the following.

(A) Find the coefficient of x^n in the expansion of $e^x\cos x$.

(B) If $\lim_{x \to 0} \frac{x(1+a\cos x)-b\sin x}{x^3} = 1$ then find a and b.

(C) Reduce the following matrices into reduce row echelon form

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

**********Best of Luck**********

$-a\sin x$

$x\,a\cos x$

$-a\cos x + x a\sin x$

$\sim$

$x a \sin x$

$a\sin x + x a\cos x$

$\frac{-\frac{7}{2}}{2}$

$\frac{-\frac{7}{2}}{2}$

$-\frac{7}{4}$