School of Engineering
B.TECH Civil Engineering
Mid Term Examination - Nov 2023

Duration : 90 Minutes
Max Marks : 50

Sem I - C1UC122B - Engineering Mathematics-I

General Instructions
Answer to the specific question asked
Draw neat, labelled diagrams wherever necessary
Approved data hand books are allowed subject to verification by the Invigilator

1) Which test is used to check the behaviour of alternating series? Give an example. — K2 (2)

2) Find all the eigenvalues of a 3x3 matrix whose all entries are 3. — K1 (3)

3) Find the Taylor series generated by $f(x) = e^x$ at $x = 2$. — K2 (4)

4) Determine whether the series $\sum_{n=1}^{\infty} \dfrac{2^{n+2}}{n^n}$ converges or diverges. — K2 (6)

5) Write the algorithm to find the Taylor's series of the function $f(x) = \cos 3x$ about $x = a, \ a \in \mathbb{R}$ — K3 (6)

6) Solve the system of equations $x_1 + x_2 + x_3 = 1, \ 3x_1 + x_2 - 3x_3 = 5$ and $x_1 - 2x_2 - 5x_3 = 10$ by Gauss elimination method. — K3 (9)

7) Find the eigenvalues and eigenvectors of the following matrix. $C = \begin{bmatrix} 1 & 0 & 1 \\ 0 & 1 & 1 \\ 1 & 1 & 0 \end{bmatrix}$. — K4 (8)

8) Find the rank and inverse of the matrix [if exits] $\begin{bmatrix} 1 & 1 & 1 & 1 \\ 2 & 5 & 0 & 3 \\ 1 & 1 & 3 & 5 \\ 2 & 1 & 2 & 3 \end{bmatrix}$ — K4 (12)

OR

Analyze the convergence of the power series $\sum_{n=1}^{\infty}(-1)^{n-1}\dfrac{x^{2n-1}}{2n-1}$ and show that it converges for $-1 \le x \le 1$ — K4 (12)