



Mid Term (Odd) Semester Examination 2025

Roll no.....

Name of the Course and semester: B.Tech., Semester IName of the Paper: Engineering Mathematics for Artificial Intelligence-IPaper Code: TMA 102

Time: 1.5 hour

Maximum Marks: 50

Note:

- (i) Answer all the questions by choosing any one of the sub questions
- (ii) Each question carries 10 marks.

Q1.

(10 Marks)

- a. Find the inverse of the matrix $\begin{bmatrix} 1 & 2 & 3 \\ 2 & 4 & 5 \\ 3 & 6 & 6 \end{bmatrix}$ by applying elementary operations. (CO1)

OR

- b. Find the rank of the matrix $\begin{bmatrix} 1 & 2 & 3 \\ 2 & 4 & 5 \\ 3 & 6 & 6 \end{bmatrix}$ by reducing into Normal Form. (CO1)

Q2.

(10 Marks)

- a. Test the consistency of the system of linear equations: $\left. \begin{array}{l} x + 2y + 3z = 4 \\ x + 4y + 9z = 6 \\ x + y + z = 3 \end{array} \right\}$. If consistent then solve them completely. (CO1)

OR

- b. Find whether or not the vectors $[3,1,-4], [2,2,-3], [0,-4,1]$ are linearly dependent or independent. (CO1)

Q3.

(10 Marks)

- a. Verify the Cayley-Hamilton theorem for the matrix $A = \begin{bmatrix} 1 & 2 & -2 \\ 1 & 2 & 1 \\ -1 & -1 & 0 \end{bmatrix}$. (CO1)

OR

- b. Reduce the matrix $A = \begin{bmatrix} 1 & -1 & 2 \\ 0 & 2 & -1 \\ 0 & 0 & 3 \end{bmatrix}$ to diagonal form by similarity transformation. (CO1)



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Q4.

(10 Marks)

- a. If $y = (x^2 - 1)^n$, use Leibnitz's theorem to show that

$$(x^2 - 1)y_{n+2} + 2xy_{n+1} - n(n+1)y_n = 0. \quad (\text{CO2})$$

OR

- b. Find $\lim_{x \rightarrow \frac{\pi}{2}} (\sin x)^{\tan x}$.

(CO2)

Q5.

(10 Marks)

- a. If $x^x y^y z^z = c$, show that at $x = y = z$, $\frac{\partial^2 z}{\partial x \partial y} = -(x \log ex)^{-1}$.

(CO2)

OR

- b. Find the Gradient of the function $u = \log \sqrt{x^2 + y^2 + z^2}$ at the point $(1, 1, 1)$ (CO2)