

BACHELOR OF TECHNOLOGY (CBCS - 2023)
B. Tech. Sem-I INFORMATION TECHNOLOGY : WINTER: 2025
SUBJECT: ENGINEERING MATHEMATICS-I

Day : Monday
Date : 08/12/2025

W-27656-2025

Time : 10:00 AM-01:00 PM
Max. Marks : 60

N.B.

- 1) All questions are **COMPULSORY**.
- 2) Figures to the **RIGHT** indicate **FULL** marks.
- 3) Assume suitable data **WHEREVER** necessary.
- 4) Draw neat diagrams **WHEREVER** necessary.

Q.1 Reduce the following matrix to normal form and find the rank (10)

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

OR

Q.1 Examine for consistency and solve, if consistent (10)

$$\begin{aligned} x + y + z &= 1 \\ x + 2y + 4z &= 2 \\ x + 4y + 10z &= 4 \end{aligned}$$

Q.2 Find the continued product of the roots of $(1 + i\sqrt{3})^{1/4}$ (10)

OR

Q.2 If $\tan(x + iy) = i$ where x and y are real then show that x is indeterminate and y is infinite. (10)

Q.3 Find the n^{th} derivative of $y = \frac{1}{x^2 + a^2}$ (10)

OR

Q.3 Obtain the expansion of $e^x \sin x$ upto the term in x^4 (10)

Q.4 Evaluate: $\lim_{x \rightarrow \frac{\pi}{2}} (1 - \sin x) \tan x$ (10)

OR

Q.4 Test the convergence of the series $\sum_{n=1}^{\infty} \frac{n!}{n^n}$ (10)

Q.5 If $u = \sin^{-1} \left[\frac{\sqrt{x} - \sqrt{y}}{x^{1/3} + y^{1/3}} \right]$ then find the value of $x^2 \frac{\partial^2 u}{\partial x^2} + 2xy \frac{\partial^2 u}{\partial x \partial y} + y^2 \frac{\partial^2 u}{\partial y^2}$ (10)

OR

Q.5 If $u = x^z + z^x$ then find $\frac{\partial^2 u}{\partial x \partial z}$ (10)

Q.6 Examine $u = x + y - z$, $v = x - y + z$, $w = x^2 + y^2 + z^2 - 2yz$ for functional dependence and if dependent, find the relation. (10)

OR

Q.6 Find $\frac{\partial(u, v, w)}{\partial(x, y, z)}$ when $ux = yz$, $vy = zx$, $wz = xy$ (10)
