

BACHELOR OF TECHNOLOGY (CBCS - 2023)
B. Tech. Sem-I Computer Science & Engineering AI & ML : SUMMER : 2025
SUBJECT: ENGINEERING MATHEMATICS-I

Day : Tuesday
 Date : 13/05/2025

S-27614-2025

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) Use of non-programmable calculator is allowed.

Q.1 Find the eigen values and eigen vectors of $A = \begin{bmatrix} 6 & -2 & 2 \\ -2 & 3 & -1 \\ 2 & -1 & 3 \end{bmatrix}$. (10)

OR

Q.1 Solve (10)

$$\begin{aligned} x + y + 2z &= 6 \\ x + 2y + 4z &= 10 \\ x + 4y + 8z &= 18 \end{aligned}$$

Q.2 Find all the values of $(1-i)^{1/4}$. (10)

OR

Q.2 Find the real and imaginary part of $i^{\log(1+i)}$. (10)

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

OR

Q.3 Expand $\sqrt{\frac{1+e^x}{2e^x}}$ up to the term containing x^2 . (10)

Q.4 Evaluate: $\lim_{x \rightarrow 0} (\cot x)^{\sin x}$. (10)

OR

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

Q.5 If $u = \log(x^3 + y^3 + z^3 - 3xyz)$ then show that (10)

$$\left(\frac{\partial}{\partial x} + \frac{\partial}{\partial y} + \frac{\partial}{\partial z} \right)^2 u = \frac{-9}{(x+y+z)^2}$$

OR

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

Q.6 If $x + y + z = u$, $y + z = uv$, $z = uvw$ (10)

Find $\frac{\partial(u, v, w)}{\partial(x, y, z)}$.

OR

Q.6 Examine $u = \frac{x-y}{x+y}$, $v = \frac{x+y}{x}$ for functional dependence. (10)

* * * *