

BACHELOR OF TECHNOLOGY (CBCS - 2023)
B. Tech. Sem-I INFORMATION TECHNOLOGY : SUMMER : 2024
SUBJECT: ENGINEERING MATHEMATICS-I

Day : Wednesday
Date : 08/05/2024

S-27656-2024

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 labeled diagrams **WHEREVER** necessary.
- 5) Use of **non-programmable** calculator is **allowed**.

Q.1 Find the rank of the matrix by reducing it to normal form (10)

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

OR

Q.1 Find eigen values and eigen vectors for (10)

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

Q.2 Find the cube roots of $(1 - \cos \theta - i \sin \theta)$. (10)

OR

Q.2 If $\cos\left(\frac{\pi}{4} + ia\right) \cosh\left(b + i\frac{\pi}{4}\right) = 1$ then find the value of b . (10)

Q.3 If $y^{1/m} + y^{-1/m} = 2x$, prove that $(x^2 - 1)y_{n+2} + (2n+1)xy_{n+1} + (n^2 - m^2)y_n = 0$. (10)

OR

Q.3 Expand $e^{x \cos x}$ upto x^4 . (10)

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

OR

Q.4 Evaluate: $\lim_{x \rightarrow 0} \frac{1}{x^2} - \cot^2 x$ (10)

Q.5 If $u = \tan^{-1} \frac{\sqrt{x^3 + y^3}}{\sqrt{x} + \sqrt{y}}$ 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)

OR

Q.5 Find the value of n for which $u = e^{-mx} \sin(nt - mx)$ satisfies $\frac{\partial u}{\partial t} = h \frac{\partial^2 u}{\partial x^2}$ (10)

Q.6 Examine $u = \frac{x-y}{1+xy}$, $v = \tan^{-1} x - \tan^{-1} y$ for functional dependence and if (10)

dependent, find the relation between them.

OR

Q.6 Find the maximum and minimum values of $\sin x + \sin y + \sin(x+y)$. (10)
