

BACHELOR OF TECHNOLOGY (CBCS - 2023)
B. Tech. Sem-I Computer Science & Engineering AI & ML : WINTER : 2024
SUBJECT: ENGINEERING MATHEMATICS-I

Day : Monday
Date : 02/12/2024

W-27614-2024

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) Use of non-programmable **CALCULATOR** is allowed.
- 4) Assume suitable data if necessary.

Q.1 Find eigen values and eigen vectors of $A = \begin{bmatrix} 1 & 0 & -1 \\ 1 & 2 & 1 \\ 2 & 2 & 3 \end{bmatrix}$ [10]

OR

Q.1 Reduce the following matrix to its normal form and hence find its rank where [10]

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

Q.2 Solve : $x^3 = -1 - i\sqrt{3}$ [10]

OR

Q.2 Determine the locus represented by $\text{amp}\left(\frac{z+1}{z}\right) = \frac{\pi}{4}$. [10]

Q.3 If $y = e^{m \cos^{-1} x}$, then prove that $(1-x^2)y_{n+2} - (2n+1)xy_{n+1} - (n^2+m^2)y_n = 0$. [10]

OR

Q.3 Expand $\log(1+e^x)$ upto x^4 . [10]

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

OR

Q.4 Test the convergence of series $\sum_{n=1}^{\infty} \frac{n^2}{3^n}$. [10]

Q.5 If $u = \cos^{-1}(\sqrt{x^3+y^3})$ 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 $z = x^y + y^x$, then find $\frac{\partial^2 z}{\partial x \partial y}$. [10]

Q.6 If $x+y+z=u$ [10]

$$y+z=uv$$

$$z=uvw$$

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

OR

Q.6 Verify $JJ' = 1$ when $x = r \cos \theta$, $y = r \sin \theta$. [10]

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