BACHELOR OF TECHNOLOGY (CBCS - 2023)

B. Tech. Sem-I Computer Science & Engineering AI & ML : WINTER : 2023

SUBJECT : ENGINEERING MATHEMATICS-I

Day : Thursday | Time : 10:00 AM-01:00 PM

Date : 30-11-2023 | **W-27614-2023** | 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 rank of the following matrix by reducing it to normal form. **(10)**

$$\begin{bmatrix} 1 & -1 & -2 & -4 \\ 2 & 3 & -1 & -1 \\ 6 & 3 & 0 & -7 \\ 3 & 1 & 3 & -2 \end{bmatrix}$$

OR

Q.1 Find eigen values and eigen vectors of **(10)**

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

Q.2 Express $\cos^{-1}\left(\frac{3i}{4}\right)$ in the form of $x+iy$. **(10)**

OR

Q.2 On the Argand diagram the centre of a regular hexagon represents the number (2–i) and one of the vertex represents the number (–1+i). Find the adjacent vertices. **(10)**

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

OR

Q.3 Expand e^{e^x} upto x^4. **(10)**

Q.4 Evaluate: $\lim_{x\to 1} \frac{x}{x-1} - \frac{1}{\log x}$ **(10)**

OR

Q.4 Examine for convergence : $\frac{1}{1+\sqrt{2}} + \frac{2}{1+2\sqrt{3}} + \frac{3}{1+3\sqrt{4}} + \ldots$. **(10)**

Q.5 If $u = \cos ec^{-1}\sqrt{\frac{x^{1/3}+y^{1/3}}{x^{1/2}+y^{1/2}}}$ 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 In calculating the volume of right circular cone errors of 2% and 1% are made in height and radius of base respectively. Find the percentage error in volume. **(10)**

Q.6 Examine $u = \frac{x-y}{x+y}$, $v = \frac{x+y}{x}$ for functional dependence and if dependent, find the relation between them. **(10)**

OR

Q.6 Find the maximum and minimum values of $x^3 + 3xy^2 - 3x^2 - 3y^2 + 4$. **(10)**