

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

Day : Thursday
 Date : 30-11-2023

W-27656-2023

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 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: $\lim_{x \rightarrow 1} \frac{x}{x-1} - \frac{1}{\log x}$ (10)

OR

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

Q.5 If $u = \cos \sec^{-1} \sqrt{\frac{x^{\frac{1}{3}} + y^{\frac{1}{3}}}{x^{\frac{1}{2}} + y^{\frac{1}{2}}}}$ then find the value of $x^2 \frac{\partial^3 u}{\partial x^2} + 2xy \frac{\partial^2 u}{\partial x \partial y} + y^2 \frac{\partial^2 u}{\partial y^2}$. (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)