Roll No. | | | | | | | | | | | | | **Total No. of Pages : 02**

Total No. of Questions : 08

B.Tech. (CSE / IT) (2018 & Onwards) (Sem.–1)

MATHEMATICS-I

Subject Code : BTAM-104-18

M.Code : 75362

Time : 2 Hrs. **Max. Marks : 30**

INSTRUCTIONS TO CANDIDATES :

1. **Attempt any FIVE question(s), each question carries 6 marks.**

1) a) Expand $f(x) = e^{\sin x}$ upto the term containing x^4.

b) Show that $f(x) = \sin x\,(1 + \cos x)$ has a maximum at $x = \pi/3$.

2) a) Find the volume of the solid generated by revolving $\frac{x^2}{a^2}+\frac{y^2}{b^2} = 1, a > b$ about the major axis.

b) Using Gamma function evaluate $\int_0^\infty \sqrt{x}\, \exp(-3\sqrt{x})\, dx$.

3) a) If $A = \begin{bmatrix} 5 & 4 \\ 1 & 1 \end{bmatrix}$, $B = \begin{bmatrix} 1 & -2 \\ 1 & 3 \end{bmatrix}$ and $C = \begin{bmatrix} 3 & 2 \\ 1 & 4 \end{bmatrix}$, then show that $(AB)C = A(BC)$.

b) Solve the equations using Cramer rule $2x + 3y + 4z = 11$, $x + 5y + 7z = 15$, $3x + 11y + 13z = 25$.

4) a) Find the rank of the matrix $\begin{bmatrix} -8 & 1 & 4 \\ 4 & 4 & 7 \\ 1 & -8 & 4 \end{bmatrix}$.

b) Solve using Gauss elimination method $x - y + 2z = 3$, $x + 2y + 3z = 5$, $3x - 4y - 5z = -13$.

5) a) Express $v = (2, -5, 3)$ in R^3 as a linear combination of vectors $u_1 = (1, -3, 2)$, $u_2 = (2, 4, -1)$, $u_3 = (1, -5, 7)$.

b) Determine whether the vectors $u_1 = 2t^2 + 4t - 3$ and $u_2 = 4t^2 + 8t - 6$ are linearly dependent?

6) a) Suppose the mapping $F : R^2 \to R^2$ is defined by $F(x, y) = (x + y, x)$.

Using the properties of matrices, show that F is a linear mapping.

b) Find the dimension and a basis of the subspace W of $P_3(t)$ spanned by

$u = t^3 + 2t^2 - 3t + 4$, $v = 2t^3 + 5t^2 - 4t + 7$, $w = t^3 + 4t^2 + t + 2$.

7) Find the characteristic equation of the matrix $\begin{bmatrix} 1 & 4 \\ 2 & 3 \end{bmatrix}$ and hence compute A^{-1}.

8) Reduce the matrix $\begin{bmatrix} 5 & 3 & 7 \\ 3 & 26 & 2 \\ 7 & 2 & 10 \end{bmatrix}$ to the diagonal form.

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