Roll No. | | | | | | | | | | | | | **Total No. of Pages : 03**

Total No. of Questions : 18

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

MATHEMATICS-I

Subject Code : BTAM-104-18

M.Code : 75362

Time : 3 Hrs. **Max. Marks : 60**

INSTRUCTIONS TO CANDIDATES :

1. **SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.**
2. **SECTION - B & C have FOUR questions each.**
3. **Attempt any FIVE questions from SECTION B & C carrying EIGHT marks each.**
4. **Select atleast TWO questions EACH from SECTION - B & C.**

SECTION-A

1) Can Rolle's theorem be applied to the function $f(x) = 2 + (x - 1)^{2/3}$, $x \in [0, 2]$.

2) Define beta function.

3) Evaluate $\lim_{x \to 0} \frac{x \cos x - \sin x}{x^2 \sin x}$

4) Find the values of x, y, z, a which satisfy the relation $\begin{vmatrix} x-3 & 2y-x & 0 & -7 \\ z-1 & 4a-6 & -3 & 2a \end{vmatrix}$

5) Find adjoint of $\begin{vmatrix} 1 & -1 \\ -2 & 0 \end{vmatrix}$

6) Define basis of vector spaces.

7) Give the statement of rank nullity theorem.

8) Give any two properties of Eigen values.

9) Define symmetric matrix with an example.

10) Find sum and product of latent roots of the matrix $\begin{vmatrix} 2 & 1 \\ -2 & 3 \end{vmatrix}$.

SECTION-B

11) a) Expand $f(x) = \sin^{-1}x$ by Maclaurin's theorem.

b) Evaluate $\lim_{x \to a} \frac{x^a - a^x}{x^x - a^a}$.

12) a) Evaluate the integral $\int_0^1 \frac{1}{\sqrt{1 - x^4}} dx$ in terms of gamma function.

b) Find maxima of $f(x, y) = 2(x^2 - y^2) - x^4 + y^4$.

13) a) Prove that $\begin{vmatrix} 1-a & 1 & 1 \\ 1 & 1-b & 1 \\ 1 & 1 & 1-c \end{vmatrix} = abc\left(1 - \frac{1}{a} - \frac{1}{b} - \frac{1}{c}\right)$

b) Solve the equations $x + y + z = 1$, $x + 2y + 3z = 6$, $x + 3y + 4z = 6$ using Cramer's rule.

14) a) Are the vectors (2, 1, 1), (2, 0, –1), (4, 2, 1) linearly dependent.

b) Find the rank of the matrix : $\begin{vmatrix} 5 & 3 & 7 \\ 3 & 26 & 2 \\ 7 & 2 & 10 \end{vmatrix}$

SECTION-C

15) Show that the matrix $\begin{vmatrix} 2 & 0 & -1 \\ 5 & 1 & 0 \\ -0 & 1 & 3 \end{vmatrix}$ satisfies the equation $A^3 - 6A^2 + 11A - I = 0$.

16) Let T : $R^3 \rightarrow R^2$ be the linear transformation defined by $T \begin{pmatrix} x \\ y \\ z \end{pmatrix} = \begin{pmatrix} x-y \\ x-z \end{pmatrix}$, then find the matrix representation of T w.r.t. the ordered basis $X = \{(1, 0, 1), (1, 1, 0), (0, 1, 1)\}^T$ in R^3 and $Y = \{(1, 0), (0, 1)\}^T$ in R^2.

17) a) Is the matrix $\begin{bmatrix} 4 & 2 & 1 \\ 6 & 3 & 4 \\ 2 & 1 & 0 \end{bmatrix}$ orthogonal ?

b) Write the matrix $\begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & -8 & 9 \end{bmatrix}$ as the sum of symmetric and skew symmetric matrices.

18) Reduce the matrix $\begin{bmatrix} -1 & 2 & -2 \\ 1 & 2 & 1 \\ 1 & -1 & 0 \end{bmatrix}$ to the diagonal form.

NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.