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

Total No. of Questions : 18

B.Tech.(CSE/IT) (2018 & Onwards)/(Civil Engg.)/(Computer Engg.)
(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. Calculate $\Gamma\left(\frac{1}{2}\right)$.
2. Show that beta function is symmetric.
3. Compute $\lim_{x\to 0} \frac{\log x}{\cot x}$.
4. If $A=\begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$ and $B=\begin{bmatrix} 1 & 3 \\ 0 & 5 \end{bmatrix}$. Compute AB.
5. Find the eigen values of the matrix $\begin{bmatrix} 1 & 2 \\ 3 & 1 \end{bmatrix}$.
6. Define symmetric and skew-symmetric matrices.
7. State rank and nullity theorem.
8. Evaluate $\int_1^{\infty} \frac{dx}{x^2}$.
9. Find the rank of the matrix $\begin{bmatrix} 2 & 1 & -4 \\ 3 & 5 & -7 \\ 4 & -5 & -6 \end{bmatrix}$.
10. State Rolle's theorem.

## SECTION-B

11. Find the eigen value and eigen vector of the following matrix $A=\begin{bmatrix} 5 & 4 \\ 1 & 2 \end{bmatrix}$

12. Find the maximum and minimum value of $f(x, y) = x^3 + y^3 - 3xy$.

13. Verify Cayley-Hamilton theorem for the matrix $A=\begin{bmatrix} 1 & 2 & 0 \\ -1 & 1 & 2 \\ 1 & 2 & 1 \end{bmatrix}$

14. Find the volume generated by revolving the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ about the x-axis.

## SECTION-C

15. Solve the following system using Gauss elimination :

    $x - 2y + z = 0$, $2x + y - 3z = 5$, $4x - 7y + z = -1$.

16. a) Find the volume of the solid generated by the revolution of the cardioids $r = a(1 + \cos\theta)$ about the initial line.

    b) Find the volume of the sphere of radius $a$.

17. a) Use Cramer's rule to solve $2x + 3y - z = 1$, $4x + y - 3z = 11$, $3x - 2y + 5z = 21$.

    b) Evaluate $\int_0^\infty (x^2+4)e^{-2x^2}dx$ using gamma function.

18. a) Show that the transformation T : $R^3 \to R^3$ define by T $(x, y, z) = (x + y, y + z, z + x)$ is linear.

    b) Let T : $R^3 \to R^3$ define by T $(x, y, z) = (x + y + z, 2x + 2y + 2z, 3x + 3y + 3z)$.

    Find the associated matrix corresponding to standard basis.

**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.**