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Total No. of Pages : 03

Total No. of Questions : 18

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

MATHEMATICS-I

Subject Code : BTAM-104-18

Paper ID : [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 from SECTION - B & C.**

SECTION-A

1. Verify Rolle's theorem for $f(x) = x(2-x)e^{\frac{3x}{4}}$ in (0,2)

2. Define Beta function and show that it is symmetric.

3. Obtain first three terms of Taylor's series of cosx about $x = \frac{\pi}{4}$.

4. If $A + B = \begin{bmatrix} 1 & -1 \\ 3 & 0 \end{bmatrix}$ and $A - B = \begin{bmatrix} 3 & 1 \\ 1 & 4 \end{bmatrix}$ find AB.

5. Find rank of the matrix $\begin{bmatrix} 1 & 6 & -2 \\ 2 & 2 & 1 \\ 3 & 8 & -1 \end{bmatrix}$.

6. State rank-nullity theorem.

7. Define range of a linear transformation.

8. Define symmetric matrix, also give suitable example.

9. Show that, If zero is an Eigen value of a matrix then it is singular.

10. In an n dimensional space every set of '$n + 1$' vectors is linearly dependent or independent. Justify your answer.

SECTION-B

11. a) Suppose that a function f is differentiate on [0,1] and that its derivative is never zero. Using mean value theorem, Show that $f(0) \neq f(1)$

b) Evaluate the limit $\lim_{x \to \frac{\pi}{2}} \left(\frac{1 - sinx}{sinx + \cos 2x} \right)$

12. a) Evaluate the integral $\int_2^{\infty} \frac{2dx}{x^2 - x}$, if it exists.

b) Find the area of the surface generated by revolving the curve $y = 2\sqrt{x}\ 1 \leq x \leq 2$ about the x-axis

13. a) Find the inverse of the matrix $\begin{bmatrix} 2 & 1 & -1 \\ 0 & 2 & 1 \\ 5 & 2 & -3 \end{bmatrix}$ using Gauss Jordan method.

b) Find the rank of the matrix $\begin{bmatrix} 0 & 1 & -3 & -1 \\ 1 & 0 & 1 & 1 \\ 3 & 1 & 0 & 2 \\ 1 & 1 & -2 & 0 \end{bmatrix}$

14. Solve the following system of equations by Cramer's rule

$$2x - 2y + z = 1, x + 2y + 2z = 2, 2x + y - 2z = 7$$

SECTION-C

15. a) By giving proper reasoning determine whether S forms a subspace of Vector space V.

Operations vector addition '+' and scalar multiplications '.' are usual addition and scalar multiplication defined on set of polynomials of degrees less than or equal to 3(P_3) and 3-tuple space (V_3).

If (i) $S = \{p \in P_3 \mid deg(p) = 3\}, V = P_3$

(ii) $S = \{(x, y, z) \mid x = 3y\}, V = V_3$

b) Determine whether the following are Linearly dependent or not?

$$x_1 = (1,2,1), x_2 = (2,1,4), x_3 = (1,8,-3)$$

16. a) Let V = P_4, vector space formed by polynomials of degrees less than or equal to 4 under usual addition and scalar multiplication of polynomials. Find the dimension of subspace U of V, where U is

$$S = \{p \in P_4 \mid p(1) = 0, p'(0) = 0\}$$

b) Check whether the transformation $T: V_3 \rightarrow V_2$ defined by $T(x,y,z) = (x+z, x+y)$ represent a Linear transformation or not?

17. Find the Eigen values and Eigen vectors for the matrix.

$$\begin{bmatrix} 2 & -2 & 3 \\ 1 & 1 & 1 \\ 1 & 3 & -1 \end{bmatrix}$$

18. a) If A is an orthogonal matrix prove that $|A| = \pm 1$

b) Define similar matrices and prove that similar matrices have same eigen values.