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Assignment Question of BCA – 1 Sem

Subject: Mathematics – 1

1. Use Cramer's Rule to solve the following system of equations:

(i) $2x - 3y + z = 7, 2x + y - z = 1, 4y + 3z = -11$

(ii) $-x - 2y + 2z = 1, x - y + z = 3, 2x + y - z = 2$

2. Find the adjoint of matrix A = $\begin{bmatrix} 1 & 2 & 3 \\ 0 & 5 & 0 \\ 2 & 4 & 3 \end{bmatrix}$ and verify the result

A(adjA) = (adjA)A = |A|I

3. Reduce the following matrix into normal form and hence find its rank:

$$A = \begin{bmatrix} 6 & 3 & 0 & -7 \\ 2 & 3 & -1 & -1 \\ 3 & 1 & 3 & -2 \\ 1 & -1 & 2 & -4 \end{bmatrix}$$

4. Find Eigen value and Eigen vectors for the matrix: $A = \begin{bmatrix} 2 & 2 & 1 \\ 1 & 3 & 1 \\ 1 & 2 & 2 \end{bmatrix}$

5. Verify that matrix $A = \begin{bmatrix} 1 & 2 & 2 \\ 2 & 1 & 2 \\ 2 & 2 & 1 \end{bmatrix}$; Satisfies it's own characteristic equation and also find A^{-1}

6. Evaluate: (i) $\lim_{x\to 2} \frac{x^{10}-1024}{x^5-32}$ (ii) $\lim_{x\to 0} \frac{sin^2 3x}{x^2}$ (iii) $\frac{d}{dx} cos(cot\, x^2)$ (iv) $\frac{d}{dx}[(sinx)^x + x^{\log x}]$ (v) nth derivative of log(ax+b)

7. A function f is defined by

$$f(x) = \begin{cases} -x^2 & if \quad x \le 0 \\ 5x - 4 & if\ 0 < x \le 1 \\ 4x^2 - 3x & if\ 1 < x < 2 \\ 3x + 4 & if \quad x \ge 2 \end{cases}$$

Examine f for continuity at $x = 0, 1, 2$. Also discuss the kind of discontinuity, if any.

8. Show that the function $f(x)$ is continuous at $x = 3$,

$$f(x) = \begin{cases} \dfrac{x^2 - 9}{x - 3} & for\ x \neq 3 \\ 6 & for\ x = 3 \end{cases}$$

9. Define continuity, discontinuity and types of discontinuities with suitable examples.

10. (i) Expand $e^x cosx$ by Maclaurin's theorem.
(ii) Expand log sinx in the powers of $(x - 2)$ using Taylor's expansions.

11. (i) State Rolle's Theorem and verify for $f(x) = 2x^3 + x^2 - 4x - 2$
(ii) State Lagrange's Mean Value Theorem and verify for f(x) = (x-1)(x-2)(x-3) in (0,4).

12. (i) If $cos^{-1}\frac{y}{b} = \log(\frac{x}{n})^n$, then show that $x^2 y_{n+2} + (2n+1)xy_{n+1} + 2n^2 y_n = 0$
(ii) If $y = \cos(msin^{-1}x)$, then $(y_n)_0$

13. From the definition of a definite integral as the limit of a sum evaluate $\int^b e^x dx$.

14. (i) If a, b, c be any three vector the proof that [a+b, b+c, c+a] = 2 [a, b, c]
(ii) Calculate angle between 7i-8j+9k and 3i+20j+5k

15. (i) Find the area of triangle whose vertices are A(3,-1,2), B(1,-1,3) and C(4,-3,1).
(ii) Find given vectors 5i+6j+7k, 7i-8j+9k and 3i+20j+5k are coplanar or not.

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