25U161 (Pages: 2) Name : .....

Reg. No : .....

FIRST SEMESTER UG DEGREE EXAMINATION, NOVEMBER 2025

(FYUGP)

(Regular/Supplementary/Improvement)

CC24UBCA1CJ102 - MATHEMATICAL FOUNDATIONS FOR COMPUTER APPLICATIONS

(B.C.A. - Major Course)

(2024 Admission onwards)

Time: 2.0 Hours Maximum: 70 Marks

Credit: 4

Part A (Short answer questions)

Answer ***all*** questions. Each question carries 3 marks.

1. Verify whether the matrix $A = \begin{bmatrix} 1 & 2 & -3 \\ 2 & 10 & 4 \\ -3 & 4 & -3 \end{bmatrix}$ is symmetric or skew-symmetric. [Level:2] [CO1]

2. Find all the minors and cofactors of the matrix $A = \begin{bmatrix} 1 & 1 \\ 5 & -2 \end{bmatrix}$. [Level:2] [CO1]

3. Show that the matrix $A = \begin{bmatrix} 2 & 3 \\ 1 & 2 \end{bmatrix}$ satisfies the equation $A^2 - 4A + I = 0$. [Level:2] [CO1]

4. Define Row matrix and Coloum matrix with an example. [Level:1] [CO1]

5. If A= $\begin{bmatrix} 3 & -1 \\ 0 & 3 \end{bmatrix}$ and $B = \begin{bmatrix} -1 & 1 \\ 1 & -1 \end{bmatrix}$, find $(B^T - A^T)^T$. [Level:2] [CO1]

6. Using first principle of differentiation , evaluate $f'(x)$ for the function $f(x) = 10$. [Level:2] [CO4]

7. Use logarithmic differentiation to differentiate the function $y = (x-7)(x-2)$. [Level:3] [CO4]

8. Evaluate the following integral (i) $\int x^3\, dx$. (ii) $\int (\frac{1}{x^2} + x^3)\, dx$ [Level:2] [CO5]

9. Evaluate the definite integral $\int_2^3 (8 + x^2)\, dx$ [Level:2] [CO5]

10. Evaluate $\int_1^2 \frac{\ln x}{x} + 2x\, dx$. [Level:2] [CO5]

(Ceiling: 24 Marks)

Part B (Paragraph questions/Problem)

Answer ***all*** questions. Each question carries 6 marks.

11. If A= $\begin{bmatrix} 3 & 0 \\ 2 & 5 \end{bmatrix}$, $B = \begin{bmatrix} 2 & 3 \\ 4 & 1 \end{bmatrix}$, and $C = \begin{bmatrix} -2 & 1 \\ 0 & 5 \end{bmatrix}$. Prove the associative property for the matrix multiplication. [Level:2] [CO1]

12. Apply elementary row transformations for the matrix $A = \begin{bmatrix} 1 & 2 & 0 \\ 2 & 1 & 0 \\ 5 & 4 & 1 \end{bmatrix}$ to reduce to Identity Matrix. [Level:3] [CO1]

13. Apply Gauss Elimination method to solve the given system of equations [Level:3] [CO2]
$9x_1 + 3x_2 = -5$
$2x_1 + x_2 = -1.$

14. Find the magnitude of the vector perpendicular to both the vectors $\vec{a} = 2\vec{i} + 3\vec{j} + \vec{k}$ and $\vec{b} = \vec{i} - \vec{j} + \vec{k}$. [Level:2] [CO3]

15. Use Chain Rule to differentiate the following fuctions [Level:3] [CO4]

1. $f(x) = ln(x^3 - \sqrt{x} + 2x).$
2. $f(x) = \left(\frac{2}{3}x^3 + 4x^2 + \sqrt{x}\right)^4.$

16. Find [Level:2] [CO4]

1. $\lim_{x \to 2} \frac{2x^2 - 5}{4x + 6}$
2. $\lim_{y \to -1} \frac{-y^3 + 2y^2 - y + 1}{y^2 + 1}$
3. $\lim_{z \to 1} \frac{z - 3}{z^2 - 9}.$

17. Evaluate $\int 2x\sqrt{x^2 + 1}dx$ [Level:3] [CO5]

18. Evaluate $\int \frac{1}{(x + 3)(x - 4)}dx.$ [Level:3] [CO5]

(Ceiling: 36 Marks)

Part C (Essay questions)

Answer any ***one*** question. The question carries 10 marks.

19. Find the eigen values and corresponding eigen vectors of the matrix $A = \begin{bmatrix} 1 & 3 \\ 2 & 2 \end{bmatrix}.$ [Level:2] [CO2]

20. (a) Use product rule to differentiate the function $f(x) = (2x + \frac{1}{x})(x - \frac{1}{x} + 1).$ [Level:2] [CO4]

(b) Differentiate the functiond $y = \frac{4x^2 - 3x + 1}{3x^2 + 2}.$

(1 × 10 = 10 Marks)

****