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(Pages : 3)

Name.....

Reg. No.....

**FIRST SEMESTER (CBCSS—UG) DEGREE EXAMINATION
NOVEMBER 2023**

B.C.A.

BCA 1C 01—MATHEMATICAL FOUNDATION FOR COMPUTER APPLICATIONS

(2019—2023 Admissions)

Time : Two Hours

Maximum : 60 Marks

Section A (Short Answer Type Questions)

Answer all questions.

Each question carries 2 marks.

Ceiling 20 marks.

1. Define transpose of a matrix with an example.

2. Find x, y, z, w is $\begin{bmatrix} x & y \\ 1z & 2w \end{bmatrix} + \begin{bmatrix} 3 & 2 \\ 1 & 4 \end{bmatrix} = \begin{bmatrix} 1 & 0 \\ -3 & 2 \end{bmatrix}$.

3. Define singular matrix. Give example.

4. Find the rank of the matrix $\begin{bmatrix} 2 & 4 \\ 1 & 2 \end{bmatrix}$.

5. Find the derivative of $x^2 \cos x$.

6. Find $\frac{dy}{dx}$, if $y = (x^2 + x) \operatorname{cosec} x$.

7. Evaluate $\int x^2 + x \, dx$.

8. Find $\int \frac{1}{1+x^2} \, dx$.

Turn over

9. Evaluate $\int \sqrt{x} \, dx$.
10. Find $\int_0^{\frac{\pi}{2}} \frac{1}{1 + \cos x} \, dx$.
11. State Cayley-Hamilton theorem.
12. Find A^2 where $A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$.

Section B (Short Essay Type Questions)

*Answer all questions.
Each question carries 5 marks.
Ceiling 30 marks.*

13. If $A = \begin{bmatrix} 3 & -2 \\ 4 & -2 \end{bmatrix}$ find k so that $A^2 = kA - 2I$ where I is an identity matrix.
14. Compute the inverse of A , where $A = \begin{bmatrix} 1 & 0 & 2 \\ 2 & 1 & 0 \\ 3 & 2 & 1 \end{bmatrix}$.
15. Find $\frac{dy}{dx}$ if $y = \log(\sin 2x)$.
16. Evaluate $\int x^2 e^x \, dx$.
17. Differentiate $\sqrt{x}$ using first principle.
18. Find the angle between the vectors $a = [1, 2, 0]$ and $b = [3, -2, 1]$.
19. Express the matrix $\begin{bmatrix} 1 & 4 & 5 \\ 2 & 2 & 3 \\ 3 & 1 & 0 \end{bmatrix}$ as the sum of symmetric and skew symmetric matrices.

Section C (Essay Type Questions)*Answer any **one** question.**The question carries 10 marks.*

20. If $A = \begin{bmatrix} 2 & 1 \\ 1 & 7 \end{bmatrix}$ and $B = \begin{bmatrix} -2 & 5 \\ 0 & 8 \end{bmatrix}$. Verify $(AB)^{-1} = B^{-1}A^{-1}$.

21. a) Find $\frac{dy}{dx}$ if $y = (x)^x$.

b) Evaluate $\int e^x \cos x \, dx$.

(1 × 10 = 10 marks)