D 53632 **(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 $y = \left(x^2 + x\right) \operatorname{cosec} x$.

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)