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FIRST SEMESTER (CBCSS—UG) DEGREE EXAMINATION
NOVEMBER 2022

B.C.A.

BCA 1C 01—MATHEMATICAL FOUNDATION FOR COMPUTER APPLICATIONS

(2019—2022 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. Construct a 2×2 matrix, $A = [a_{ij}]$, whose elements are given by $a_{ij} = i/j$.
2. Define symmetric and skew-symmetric matrices.
3. Find the adjoint of the matrix $\begin{bmatrix} 2 & 1 \\ 1 & 7 \end{bmatrix}$.
4. Define augmented matrix.
5. Find the derivative of $\frac{e^x}{\sin x}$.
6. Find $\frac{dy}{dx}$ if $y = \sin^2 x \cos x$.
7. Find $\int \frac{2x}{1+x^2} dx$.
8. Evaluate $\int \tan x dx$.

Turn over

9. Find $\int_1^2 \frac{1}{x^2 + 6x + 5} dx$.
10. Prove that $\int_a^b f(x) dx = \int_a^b f(a-x) dx$.
11. If $A = \begin{bmatrix} 2 & 9 \\ 1 & 3 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 5 \\ 7 & 8 \end{bmatrix}$. Find AB .
12. Define limit of a function.

Section B (Short Essay Type Questions)

Answer all questions.

Each question carries 5 marks.

Ceiling 30 marks.

13. If $A = \begin{bmatrix} 1 & 2 & 3 \\ 2 & 3 & 4 \\ -1 & 1 & 2 \end{bmatrix}$ and $B = \begin{bmatrix} 0 & 2 & -1 \\ 1 & 3 & 4 \\ 0 & -2 & -3 \end{bmatrix}$ find the products AB and BA . Show that $AB \neq BA$.
14. Find the inverse of the matrix $A = \begin{bmatrix} 1 & 0 & -1 \\ 1 & 2 & 1 \\ 2 & 2 & 3 \end{bmatrix}$.
15. Find $\frac{dy}{dx}$ if $y = x^5 + x \cos x + e^x$.
16. Differentiate $x^2 e^x \sin x$.
17. Evaluate the definite integral $\int_0^\pi x \sin^3 x dx$.
18. If $A = \begin{bmatrix} 3 & -5 \\ -4 & 2 \end{bmatrix}$, then prove that $A^2 - 5A - 14I = 0$.

19. Is the system of equations
$$\begin{aligned} 2x - y + z &= 7 \\ 3x + y - 5z &= 13 \\ x + y + z &= 5. \end{aligned}$$
 consistent?

Section C (Essay Type Questions)

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

20. (a) Solve using Gauss Jordan Elimination method :

$$2x - y + 3z = 9, \quad x + y + z = 6 \quad \text{and} \quad x - y + z = 2.$$

- (b) Find the Eigen values of the matrix
$$\begin{bmatrix} 1 & 0 & -1 \\ 1 & 2 & 1 \\ 2 & 2 & 3 \end{bmatrix}.$$

21. (a) Find $\frac{dy}{dx}$ if $y = (x \sin x)^3$.

- (b) Integrate $\frac{4x}{(x-2)(x-1)}$.

(1 × 10 = 10 marks)