

**FIRST SEMESTER UG DEGREE EXAMINATION, NOVEMBER 2023****(Regular/Improvement/Supplementary)****BCA****GBCA1C01T: MATHEMATICAL FOUNDATION OF COMPUTER APPLICATIONS****Time: 2 Hours****Maximum Marks: 60****SECTION A: Answer the following questions. Each carries *two* marks.****(Ceiling 20 Marks)**

1. If  $A = \begin{bmatrix} 3 & 4 & 9 \\ 2 & 8 & 3 \end{bmatrix}$  and  $B = \begin{bmatrix} 1 & 9 & 2 \\ 3 & 0 & 5 \end{bmatrix}$ , find  $4A - 2B$ .
2. Find the matrix  $A$ , if  $A + \begin{bmatrix} 3 & 5 & -9 \\ 11 & -8 & 3 \end{bmatrix} = \begin{bmatrix} -4 & 3 & 2 \\ 2 & 9 & 3 \end{bmatrix}$
3. Construct a  $2 \times 2$  matrix  $A = [a_{ij}]$ , whose elements are given by  $a_{ij} = \frac{3j+i}{i+j}$
4. Find the rank of the matrix  $\begin{bmatrix} 1 & 5 \\ 8 & 3 \end{bmatrix}$
5. Solve the following system of equations using Gauss elimination method
 
$$\begin{aligned} 5x + 2y &= 17 \\ 3x + 4y &= 13 \end{aligned}$$
6. Find  $\frac{d}{dx} (6x^5 + 4x^3 - 3x^2 + 2x + 5)$
7. Find  $\int \sqrt{1 - \sin 2x} dx$
8. Find  $\int \sec^2(3x + 2) dx$
9. Find  $\int \left(x - \frac{1}{x}\right)^3 dx$
10. Find  $\int_0^5 x^3 - 4x^2 dx$
11. Find  $\int_0^\pi \operatorname{cosec}^2 x dx$
12. Find  $\int_0^{2\pi} \sin(3x - 2) dx$

**(PTO)**

**SECTION B: Answer the following questions. Each carries five marks.  
(Ceiling 30 Marks)**

13. Solve the following system of equations using Gauss Jordan elimination method.

$$x + 2y + z = 3$$

$$2x + 3y + 3z = 10$$

$$3x - y + 2z = 13$$

14. Find  $\vec{a} \times \vec{b}$  and  $\vec{a} \cdot \vec{b}$  if  $\vec{a} = 3\vec{i} - 2\vec{j} + 4\vec{k}$  and  $\vec{b} = 2\vec{i} + 3\vec{j} - 2\vec{k}$

15. Find  $\frac{d}{dx} \tan^{-1} x$  using first principle

16. Find  $\int (2x + 4) \sqrt{x^2 + 4x + 3} dx$

17. Find  $\int \tan^{-1} \sqrt{\frac{1 - \sin x}{1 + \sin x}} dx$

18. Find  $\int \frac{2x + 1}{(x + 1)(x - 2)} dx$

19. Find  $\int (3 - 5x) \sin^2 x dx$

**SECTION C: Answer any one question. Each carries ten marks.**

20. a) If  $A = \begin{bmatrix} 4 & 1 \\ 1 & 2 \end{bmatrix}$ , find  $2A^2 - 5A + 5I$ .

b)  $A = \begin{bmatrix} 1 & 1 & -1 \\ -2 & 0 & 2 \\ 3 & 2 & 4 \end{bmatrix}$ ,  $B = \begin{bmatrix} 1 & 3 \\ 2 & 1 \\ -1 & 4 \end{bmatrix}$  and  $C = \begin{bmatrix} 1 & 2 & 0 & -4 \\ 2 & 0 & -2 & 1 \end{bmatrix}$

Show that  $(AB)C = A(BC)$

21. a) Find  $\frac{d}{dx} \frac{x \sin x}{1 + \cos x}$

b) Find  $\frac{d}{dx} \frac{x - \cos x}{x + \sin x}$

c) Find  $\frac{d}{dx} \frac{e^x}{1 + x}$

**(1 x 10 = 10 Marks)**