**1810E620**          Candidate's Seat No : _____

First B.C.A. Sem.-1 Examination
CC-104
Fund of Mathematical Concepts

Time : 2-30 Hours]          October-2024          [Max. Marks : 70

1  A  Let $U = \{0, 1, 2, 3, 4, 5, 6, 7, 8, 9\}$ with subsets $A = \{3, 5, 7, 9\}, B = \{0, 1, 2, 3, 4, 5, 6\}$   7
      and $C = \{2, 4, 6, 8\}$. Using above informatin find : (a) $(A \cup B \cup C)'$   (b) $(A \cap B) - (A \cup C)$

   B  Let $A = \{1, 2, 5, 6, 7\}$ and $B = \{2, 4, 7, 8\}$ then,   7
      (I)  Find $A \triangle B$ and $B \triangle A$.
      (II)  Let $f : A \triangle B \to B \triangle A$, defined by $f(x) = x$, then show that f is one-one function
            using Venn diagram.

**OR**

   A  Let $A = \{0, 1, 2, 3\}$ and a function $f : A \to R$ defined by $f(x) = \frac{1-x}{1+x}$ then answer the   7
      following questions.
      (I)  Find $A \cap R_f$ (Range of f)
      (II)  Show that $f(x) - f\left(\frac{1}{x}\right) = 2f(x)$

   B  Let $f(x) = \dfrac{x - 1}{x + 1}$. Then find $f(x + 1) - f(x - 1)$, for $x > 0$.   7

2  A  Let $A = \begin{bmatrix} 1 & 1 & 2 \\ 2 & 1 & 2 \\ 3 & 4 & 1 \end{bmatrix}$. Then find the inverse of A if it exists. Also find the $A + A^T$.   7

   B  If $A = \begin{bmatrix} 1 & 3 \\ 2 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 3 \\ 2 & 4 \end{bmatrix}$, then verify $\text{adj} AB = \text{adj} A \cdot \text{adj} B$.   7

**OR**

   A  Solve the following system using Cramer's Rule:   7
$$x + 2y + 3z = 6$$
$$2x + 4y + z = 7$$
$$3x + 2y + 9z = 14$$

   B  Show the following matrix as the sum of symmetric and skew − symmetric matrices.   7
$$A = \begin{bmatrix} 2 & -2 & -1 \\ 0 & 4 & 1 \\ 1 & -3 & 1 \end{bmatrix}$$

3  A  Let two lines $l_1: x - 2y + 3 = 0$ and $l_2: 2x - 3y + 4 = 0$.   7
      (I)  Find the equation of a line passing through the intersection of $l_1$ and $l_2$ and having
            slope $\frac{2}{3}$.
      (II)  Find the equation of a line passing through the intersection of $l_1$ and $l_2$ and parallel
            to a line joining $(1, 1)$ and $(0, -1)$.

   B  Find the equation of a line pasing through two points $(2, 3)$ and $(1, 2)$. Also find the sloop   7
      of that line.

**OR**

   A  Find the equations of two lines passing through $(2, -1)$ and making angle $45°$ with the line   7
      $6x + 5y - 1 = 0$. Also show that these two lines are perpendicular to each other

   B  Find the value of k, if the distance between the points $(3, k)$ and $(4, 1)$ is $\sqrt{10}$.   7

P.T.O.

4  A  Let $y = \log(e^{x+1})$, then find $\dfrac{dy}{dx}$ using chain rule.                                                      7

   B  Find $\int (2x + 3)^6 dx$.                                                                                                  7

<div align="center">OR</div>

   A  Let $y = \sin(2x + 3)$, then find $\dfrac{dy}{dx}$ using chain rule.                                                        7

   B  Find $\int \dfrac{e^{\sqrt{x}}}{\sqrt{x}} dx$.                                                                              7


5  **Attempt any seven out of twelve.**                                                                                          14

1.  Let $A = \{3, 5\}$ and $B = \{1, 4\}$, then $n(A \times B)$.
    - (a) 2
    - (b) 4
    - (c) 6
    - (d) None of these

2.  If $n(A) = 3$, then power set of A has ____ elements.
    - (a) 8
    - (b) 6
    - (c) 9
    - (d) None of these

3.  The range of a function $f: N \to Z, f(x) = x - 1$ is ____
    - (a) N
    - (b) Z
    - (c) Q
    - (d) None of these

4.  Let a function $f: A \subseteq Z \to Z, f(x) = |x|$ is one one if A is ____.
    - (a) N
    - (b) Z
    - (c) $N \cup \{0\}$
    - (d) None of these

5.  The rank of a matrix with $a_{ij} = 1$ for all i and j is ____.
    - (a) 1
    - (b) 2
    - (c) 3
    - (d) None of these

6.  A square matrix A is a null matrix if.
    - (a) $a_{ij} = 0$ for all i and j
    - (b) $a_{ij} = 0$ for all $i \neq j$
    - (c) $a_{ij} = 0$ for all $i = j$ only
    - (d) None of these

7.  AThe determinant of an identity matrix is,
    - (a) 1
    - (b) 0
    - (c) $-1$
    - (d) None of these

8.  The slope of a line $9x - 3y + 2 = 0$ is ____.
    - (a) 1/3
    - (b) 3
    - (c) 2
    - (d) None of these

9.  Angle between two lines $x = 1$ and $y = 2$ is ____.
    - (a) $0^\circ$
    - (b) $45^\circ$
    - (c) $90^\circ$
    - (d) None of these

10. Two lines are parallel if the relation between their slopes is ____.
    - (a) $m_1 \cdot m_2 = 1$
    - (b) $m_1 \cdot m_2 = -1$
    - (c) $m_1 = m_2$
    - (d) None of these

11. as $n \to \infty, 2n \to$ ____.
    - (a) $\infty$
    - (b) 0
    - (c) 1
    - (d) None of these

12. $\int 3.14\, dx =$ ____.
    - (a) $2x + c$
    - (b) $5x + c$
    - (c) 0
    - (d) None of these