Seat No. : _____

MK-104

July-2021

B.C.A., Sem.-I

CC-104 : Fundamental Mathematical Concepts

Time : 2 Hours] **[Max. Marks : 50**

Instructions : (1) All Questions in **Section I** carry equal marks.
(2) Attempt any **TWO** questions in **Section I**.
(3) Question **5** in **Section II** is **COMPULSORY**.

SECTION – I

1. (A) (i) It is observed that a quadratic function $y = ax^2 + bx + c$ fits the point (–1, 8), (1, 4) and (2, 5) find the constant a, b and c. Estimate y when $x = 4$. **10**

(ii) If $f(x) = \frac{x^2 - x}{x + 3}$; find $\frac{f(1) + f(2)}{f(-2) + f(0)}$.

(B) (i) If A = {0, 1, 2, 3, 4}, B = $\{x/x^2 + x - 6 = 0, x \in A\}$ and C = $\{x/x^2 + x - 12 = 0, x \in A\}$ then verify that $A \cap (B - C) = (A \cap B) - (A \cap C)$. **10**

(ii) In a town of 10,000 families it was found that 40% families buy newspaper A, 20% buy newspaper B and 10% families buy newspaper C, 5% families buy A and B, 3% buy B and C and 4% buy A and C. If 2% families buy all the three newspapers, then find number of families which buy newspaper A only.

2. (A) (i) Express matrix $A = \begin{bmatrix} -1 & 2 & 3 \\ 2 & -4 & 1 \\ 4 & -2 & -3 \end{bmatrix}$ as a sum of symmetric and skew symmetric matrix. **10**

(ii) For $A = \begin{bmatrix} 1 & 3 & 2 \\ 1 & 4 & 3 \\ 1 & 3 & 4 \end{bmatrix}$ find A^{-1}.

(B) (i) Solve using Cramer's rule : $2x + y - z = 0$; $x - y + z = 0$; $x + 2y + z = 3$. **10**

(ii) If $A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$ and $I = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ find value of $A^2 + 5A + 2I$.

3. (A) (i) Find the ratio in which the line segment joining the points (1, 3) and (8, 6) is divided by the line $6x + y - 19 = 0$. **10**

(ii) Find equation of a line passes through the point (3, 1) and parallel to the line $y = \frac{2}{3}x + 4$.

(B) (i) Let A (3, 4), B(0, –5) and C(3, 1) are the vertices of ΔABC. Determine the equation of altitude from vertex A on $\overline{BC}$. **10**

(ii) If (2, –2), (8, 4) and (5, 7) are the vertices of a triangle, find equations of all three median.

4. (A) (i) Evaluate : **10**

(a) $\lim\limits_{x \to -1} \frac{x^{17} + 1}{x^{13} + 1}$

(b) $\lim\limits_{x \to \infty} \frac{(x+1)(x+2)(x+3)}{(x+4)(x+5)(x+6)}$

(ii) Find $\frac{dy}{dx}$ when $y = \left(x + \sqrt{1 + x^2}\right)^m$

(B) (i) Evaluate : **10**

(a) $\lim\limits_{x \to 0} \left(\frac{3}{x\sqrt{9-x}} - \frac{1}{x}\right)$

(b) $\int \left(12x^{\frac{3}{4}} - 9x^{\frac{5}{3}}\right) dx$

(ii) Find $\frac{d^2y}{dx^2}$ for $y = ae^{wx} + be^{-wx}$

SECTION – II

5. Attempt any **ten** : **10**

(1) If $f(x) = x^2 + 2^x$, then $f(2) - f(0) =$ _____.

(a) 7 (b) 8

(c) 6 (d) 4

(2) Let n(U) = 700, n(A) = 200, n(B) = 300 and $n(A \cap B) = 100$, then $n(A' \cap B') =$

(a) 400 (b) 600

(c) 300 (d) 200

(3) $\lim\limits_{x \to 0} \dfrac{\sin x}{x} =$ _____

(a) 1 (b) 0

(c) 2 (d) None of these

(4) If $A = \begin{bmatrix} 2 & 3x \\ x-1 & 1 \end{bmatrix}$ is a symmetric matrix, then $x =$ _____.

(a) 2 (b) (0.5)

(c) (–0.5) (d) –2

(5) Equation of Y-axis is _____.

(a) $x = a$ (b) $x = 0$

(c) $y = a$ (d) $y = 0$

(6) The vertices of a ΔABC and given by A(2, 3) and B(–2, 1) and its centroid is $G\left(1, \frac{2}{3}\right)$. Find the coordinates of the third vertex C of the ΔABC.

(a) (0, 2) (b) (1, –2)

(c) (2, –3) (d) (3, –2)

(7) If A, B and C are non-empty sets, then $(A - B) \cup (B - A)$ equals

(a) $(A \cup B) - B$ (b) $A - (A \cap B)$

(c) $(A \cup B) - (A \cap B)$ (d) $(A \cap B) \cup (A \cup B)$

(8) Find 'n', if $\lim\limits_{x \to 2} \dfrac{x^n - 2^n}{x - 2} = 80$, $n \in N$.

(a) 3 (b) 4

(c) 5 (d) 6

(9) What is a if $B = \begin{bmatrix} 1 & 4 \\ 2 & a \end{bmatrix}$ is singular matrix ?

(a) 5 (b) 6

(c) 7 (d) 8

(10) $\frac{d}{dx}\left(\frac{x^6}{x^8}\right) =$ _____.

(a) $\frac{x^2 + 2x^3}{x^6}$ (b) $\frac{-2}{x^3}$

(c) $2x^3$ (d) $-2x^3$

(11) If $A^3 = I$, then $A^{-1} =$ _____.

(a) A^2 (b) A

(c) A^{-1} (d) None of these

(12) The point which divides the joint of A(1, 2) and B(3, 4) externally in ratio 1 : 2 is _____.

(a) (0, 1) (b) (0, –1)

(c) (–1, 0) (d) (1, 0)