Seat No. : _____

MD-115

March-2022

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 from Section – I.

(3) Question – **5** in Section – II is compulsory.

(4) Use of Scientific Calculator is allowed.

Section – I

1. (A) Answer the following :

(i) There are 35 students in art class and 57 students in dance class. Find the number of students who are either in art class or in dance class. **5**

(a) When two classes meet at different hours and 12 students are enrolled in both activities.

(b) When two classes meet at the same hour.

(ii) If A = {–3, –2, –1, 0, 1, 2, 3}, B = {1, 2} and C = {–1, 0, 1} then verify the following : **5**

(a) $A \times (B \cap C) = (A \times B) \cap (A \times C)$

(b) $A - (B \cap C) = (A - B) \cup (A - C)$

(B) Answer the following :

(i) If $f(x) = x(x - 1)(2x - 1)$ then prove that $f(x + 1) - f(x + 2) = -6(x + 1)^2$. **5**

(ii) If daily cost of Production for x units of manufactured Product is given by $C(x) = 15x + 15{,}000$. Answer the following : **5**

(a) If each unit is sold for RS. 20, determine the minimum number of units that should be produced and sold to ensure no loss.

(b) If 500 units are sold daily, what price per unit should be charged, so that it guarantees no Loss ?

2. (A) Answer the following :

(i) If $A = \begin{bmatrix} 1 & 2 & 1 \\ 0 & 1 & 1 \\ 3 & 1 & 1 \end{bmatrix}$ then find $A^3 - 3A^2 - A - 3I$. **5**

(ii) If $A = \begin{bmatrix} 8 & 0 \\ 4 & -2 \\ 3 & 6 \end{bmatrix}$ and $B = \begin{bmatrix} 2 & -2 \\ 4 & 2 \\ -5 & 1 \end{bmatrix}$ then find matrix X, such that $2A + 3X = 5B$. **5**

(B) Answer the following :

(i) Find A^{-1} of matrix $A = \begin{bmatrix} 1 & 2 & 3 \\ 2 & 1 & -3 \\ 1 & 1 & 2 \end{bmatrix}$. **5**

(ii) Express the matrix $A = \begin{bmatrix} -1 & 2 & 3 \\ 2 & -4 & 1 \\ 4 & -2 & -3 \end{bmatrix}$ as a sum of symmetric and skew-symmetric matrix. **5**

3. (A) Answer the following :

(i) A line passing through the origin perpendicularly cuts the line $3x - 2y = 6$ at point M. Find the co-ordinates of M. **5**

(ii) Point A (2, 1) divides segment BC in the ratio 2 : 3. Co-ordinates of B are (1, –3) and C are (4, y). What is the value of y ? **5**

(B) Answer the following :

(i) Find the equation of the line parallel to $x - y = 0$ and drawn through the point of intersection of the lines $x - 7y + 5 = 0$ and $3x + y = 0$. **5**

(ii) Find equation of a line passes through the points (–1, 1) and (2, –4). **5**

4. (A) Answer the following :

(i) Evaluate : (a) $\lim_{x \to 4} \frac{x^2 - 3x - 4}{x^2 - 2x - 8}$

(b) $\lim_{x \to 3} \frac{\sqrt{x+2} - \sqrt{5}}{x - 3}$ **5**

(ii) Find derivative of (a) $y = \frac{x^2 + 1}{x^2 - 1}$, (b) $y = \log (2 + 3x + 4x^2)$ **5**

(B) Answer the following :

(i) Evaluate : $\int x^2 (x^3 + 2)^{5/3} \, dx$ **5**

(ii) Show that the solution of the differential equation $\frac{d^2y}{dx^2} = w^2y$ is $y = ae^{wx} + be^{-wx}$ **5**

Section – II

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

(i) 20 teachers of a school either teach Mathematics or physics. 12 of them teach Mathematics while 4 teach both the subjects. Then, the number of teachers teaching Physics only is _____.

(a) 12 (b) 8

(c) 16 (d) None of these

(ii) The function $f : A \to B$ defined by $f(x) = 4x + 7, x \in R$ is

(a) One-One (b) Many-One

(c) Odd (d) Even

(iii) If A= {x, y, z}, then number of subsets in power set of A is _____.

(a) 6 (b) 8

(c) 7 (d) 9

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

(a) 4 (b) 3

(c) –4 (d) –3

(v) If A is any square matrix, then which of the following is skew-symmetric ?

(a) $A + A^T$ (b) $A - A^T$

(c) $A A^T$ (d) $A^T A$

(vi) If $\Delta = \begin{vmatrix} 5 & 3 & 8 \\ 2 & 0 & 1 \\ 1 & 2 & 3 \end{vmatrix}$, then write the minor of the element α_{23}.

(a) –7 (b) 4

(c) 8 (d) 7

(vii) The distance of the point P(2, 3) from the x-axis is

(a) 2 (b) 5

(c) 1 (d) 3

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

(a) (–1, 0) (b) (0, –1)

(c) (0, 0) (d) (l, 0)

(ix) If the distance between (a, –5) and (2, a) is 13, find the value of a.

(a) a = 7 or a = (–10) (b) a = (–7) or a = 10

(c) a = (–7) or a = (–10) (d) a = 7 or a = 10

(x) If y = 5 then $\frac{dy}{dx}$ = _____.

(a) 5 (b) 0

(c) 1 (d) None of these

(xi) $\int 1 \, dx$ = _____.

(a) $x + k$ (b) $1 + k$

(c) $\frac{x^2}{2} + k$ (d) $\log x + k$

(xii) $\lim_{x \to -1} \frac{x^{201}+1}{x^{101}+1}$ = _____.

(a) 201/101 (b) 101/201

(c) 200/100 (d) –201/101

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