

Seat No. : 442

MR-107

December-2016

B.C.A., Sem.-I

CC-104 : Basic of Mathematics

Time : 3 Hours]

[Max. Marks : 70

- Instructions :** (1) Figures to the right indicate marks.
(2) All the questions are compulsory.

1. (A) Suppose Sharma's online music store conducts a customer survey to determine the preferences of its customers. Customers are asked what type of music they like. They may choose from the following categories: Pop (P), Jazz (J), Classical (C), and none of the above (N). Of 100 customers some of the results are as follows:

8

44 like Classical, 58 like Pop, 59 like Jazz, 31 like Classical and Pop, 39 like Pop and Jazz, 37 like Jazz and Classical and 27 like all three.

- Find (a) Number of customers who like Pop and Classical but not Jazz.
(b) Number of customers who like Classical and Jazz but not Pop.
(c) Number of customer who like only Pop.
(d) Number of customer who does not like any type of music.

OR

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

(B) Attempt the following :

6

(1) Let $f(x) = \frac{x-1}{x+1}$, then find $f\left(\frac{1}{2}\right)$ and $f\left(\frac{1}{x}\right)$.

(2) If $g(x) = \frac{x^2-x}{x+3}$, find $\frac{g(1)+g(2)}{g(-2)+g(0)}$

OR

Suppose the daily total cost in rupees of producing x chairs is given by

$$C(x) = 2.5x + 300$$

- (i) If each chair sells for Rs. 4, what is the break- even point ?
- (ii) If the selling price is increased to Rs. 5 per chair, what is the new break- even point ?
- (iii) If it is known that at least 150 chairs can be sold each day, what price should be charged to guarantee no loss ?

2. (A) Find A^{-1} of matrix $A = \begin{bmatrix} 1 & -2 & 3 \\ 2 & 1 & -3 \\ -1 & 1 & 2 \end{bmatrix}$. Also find rank of matrix A.

8

OR

For given matrices $A = \begin{bmatrix} 2 & -3 & 4 \\ 7 & 8 & -6 \\ -4 & 9 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} 7 & 8 & 6 \\ 5 & 4 & 1 \\ 2 & -6 & 8 \end{bmatrix}$, then

prove that

(i) $(A + B)^T = A^T + B^T$

(ii) $(AB)^T = B^T A^T$

(B) Solve the following system of equation using Cramer's Rule.

6

$$6x + y - 3z = 5; 2x + y + 4z = 8; x + 3y - 2z = 5$$

OR

Solve the following equations by matrix inversion method :

$$x + y + z = 6; x + 2y + 3z = 14; x + 4y + 9z = 36$$

3. (A) Attempt the following :

8

- (1) Find the ratio in which the line segment joining the points (1, 3) and (8, 6) is divided by the line $6x + y - 19 = 0$.
- (2) Find equation of a line passes through the point (3,1) and parallel to the line $y = \frac{2}{3}x + 4$.

OR

Attempt the following :

- (1) A line passes through the point of intersection of the lines $x + 2y - 1 = 0$ and $2x + 3y = 4$ and it makes intercepts on the axes equal in magnitude but opposite in signs. Find its equation.
- (2) Find the area of triangle formed by the lines $x + 4y - 11 = 0$, $x + y - 2 = 0$ and $x - 2y + 1 = 0$.

(B) Attempt the following :

6

- (1) If the distance between the points (a, -5) and (2, a) is 10 units, find the value of a.

- (2) If $(2, -2)$, $(8, 4)$ and $(5, 7)$ are the vertices of a triangle, find mid-points of each sides of a triangle.

OR

Attempt the following :

- (1) Find the equation of a line passes through the point $(5, 7)$ and perpendicular to $3x - 2y = 5$.
- (2) Let $A(3, 4)$, $B(0, -5)$ and $C(3, 1)$ are the vertices of $\triangle ABC$. Determine the equation of altitude from vertex A on \overline{BC} .

4. (A) Attempt the following :

8

(1) Find $\frac{dy}{dx}$ when $y = \log(\sin \sqrt{x^2 + 1})$

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

OR

Attempt the following :

(1) Find $\frac{dy}{dx}$ when $y = \frac{1}{(x^2 - 1)(x^2 + x + 1)}$

(2) Evaluate : $\frac{e^{5 \log_e x} - e^{4 \log_e x}}{e^{3 \log_e x} - e^{2 \log_e x}} dx$

- (B) Attempt the following :

6

(1) $\lim_{x \rightarrow -1} \frac{x^{17} + 1}{x^{13} + 1}$

(2) $\lim_{x \rightarrow \infty} \frac{(x+1)(x+2)(x+3)}{(x+4)(x+5)(x+6)}$

OR

Attempt the following :

(1) Evaluate: $\int y^2 \sqrt[3]{y} dy$

(2) Check the continuity of the function $f(x)$ at $x = 3$.

$$f(x) = \frac{x^2 - x - 6}{x - 3}; \text{ if } x \neq 3$$

$$= 5; \text{ if } x = 3$$

5. Attempt the following :

14

(1) If we are dealing with the set of all computer programmers in the world, then which of the following can be a Universal set ?

- (a) Set of all men in the world
- (b) Set of all women in the world
- (c) Set of all people in the world
- (d) Set of all Indians in the world

(2) If a function $f: A \rightarrow B$ is such that $\text{Range } f = B$ then f is a/an ?

- (a) Into function
- (b) Onto function
- (c) Injective function
- (d) None of these

(3) Give an example of disjoint set.

(4) If $n(A) = 5$ and $n(B) = 3$, what will be the value of $n(A \times B)$?

(5) Matrix A has 4 rows and 5 columns, and Matrix B has 5 rows and 2 columns. The Matrix AB will have ?

- (a) 4 rows and 2 columns
- (b) 5 rows and 3 columns
- (c) 2 rows and 4 columns
- (d) 3 rows and 5 columns

(6) Given that the matrix $A = \begin{bmatrix} 2 & -3 \\ 4 & a \end{bmatrix}$ is singular. Find value of a ?

- (a) 2
- (b) (-2)
- (c) 6
- (d) (-6)

(7) If A is orthogonal matrix then A^{-1} is _____.

- (a) A
- (b) A^T
- (c) A^2
- (d) none of these

(8) Find a distance of straight line from a point A(-3, 0) to B(0, 1).

- (a) 5
- (b) $\sqrt{5}$
- (c) 10
- (d) $\sqrt{10}$

(9) Find the equation of the line parallel to the line whose equation is $y = 6x + 7$ and whose y-intercept is 8.

- (a) $y = -6x + 8$
- (b) $y = (-1/6)x + 8$
- (c) $y = (1/6)x + 8$
- (d) $y = 6x + 8$

(10) M is the midpoint of \overline{AB} . The coordinates of A are (-2, 3) and the coordinates of M are (1, 0). Find the coordinates of B.

- (a) $(-1/2, 3/2)$
- (b) (4, -3)
- (c) (-4, 3)
- (d) (-5, 6)

(11) Are the lines $y = \frac{3x}{5} + 6$ and $y = \frac{-5x - 30}{-3}$ perpendicular?

(a) Yes

(b) No

(12) Which of the following is the indefinite integral of $\frac{3}{x^4}$?

(a) $\frac{1}{x^3} + c$

(b) $-\frac{12}{x^5} + c$

(c) $\frac{3}{5x^5} + c$

(d) $-\frac{1}{x^3} + c$

(13) What is the second ordered derivative of $f(x) = 4x^3 - 11x^2 - 14x + 19$?

(14) $\lim_{x \rightarrow 2} \frac{x^2 - 4}{x^2 + 4} = \underline{\hspace{2cm}}$

(a) 1

(b) 0

(c) $\left(-\frac{1}{2}\right)$

(d) (-1)