Enrolment No. /Seat No.: _____

GUJARAT TECHNOLOGICAL UNIVERSITY

BCA/ MCA INTEGRATED – SEMESTER I- EXAMINATION –SUMMER-2025

Subject Code: BC01001051 **Date: 12/06/2025**

Subject Name: Mathematics-1

Time:02:30 PM TO 05:00 PM **Total Marks: 70**

Instructions:

1. **Attempt all questions.**
2. **Make Suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**
4. **Use of simple calculators and non-programmable scientific calculators are permitted.**

Q.1 **(a)** Define the following terms. **(7)**

(1) Unit matrix

(2) Power set

(3) Symmetric matrix

(4) Many - One Function

(5) Coordinate Geometry

(6) Explicit Function

(7) Quadrants

(b) (i) If $U = \{0, 1, 2, 3, 4, 5, 6, 7, 8, 9\}$, $X = \{1, 2, 3\}$, $Y = \{2, 4\}$ $Z = \{1, 5, 9\}$ then find (i) $X \triangle Y$ (ii) $(X \cup Y) \cap Z$ (iii) $X' \cup Y'$ **(3)**

(ii) If $A = \begin{bmatrix} -1 & 4 \\ 3 & -5 \end{bmatrix}$ and $B = \begin{bmatrix} -1 & 5 \\ 2 & 9 \end{bmatrix}$ then show that **(4)**

$(A \cdot B)^{-1} = B^{-1} \cdot A^{-1}$

Q.2 **(a)** (i) Verify $(A \cup B)' = A' \cap B'$ by Venn diagram **(3)**

(ii) If $A = \{1, 2, 3\}$, $B = \{2, 3, 4\}$, $C = \{1, 3, 4\}$ and $D = \{2, 4, 5\}$, then verify that $(A \times B) \cap (C \times D) = (A \cap C) \times (B \cap D)$ **(4)**

(b) In a class of 42 students, each play at least one of the three games Cricket, Hockey and Football. It is found that 14 play Cricket, 20 play Hockey and 24 play Football, 3 play both Cricket and Football, 2 play both Hockey and Football. None play all the three games. Find the number of students who play Cricket but not Hockey. **(7)**

OR

(b) Define Difference of two sets. If $U = \{x/x \in N; x \leq 10\}$, $A = \{x/x \in N; x^2 < 10\}$, $B = \{2, 4, 6\}$, $C = \{x/x^3 - 3x^2 - 4x = 0\}$ Verify that (i) $A \cap (B - C) = (A \cap B) - (A \cap C)$ (ii) $A' - B' = A - B$ **(7)**

Q.3 **(a)** (i) $f: N \to N$ and $f(x) = 5x - 2$. If the range of function f is $\{3, 8, 13\}$ Find the domain of f. **(3)**

(ii) Examine whether the following functions are equal. **(4)**
$f(x) = \frac{x^2-9x+14}{x-2}$, $x \in Z - \{2\}$, and $g(x) = x - 7$, where $x \in Z - \{2\}$.

(b) The expenditure of a hostel depends upon the number of students. When there are 40 students the expenditure is Rs. 50,000 and for 50 students the expenditure is Rs. 62,000. If the relationship between the number of students and hostel expenditure is linear, find the relationship and also find the expenditure when there are 60 students in the hostel. **(7)**

OR

(a) (i) If $f(x) = x^2(x-1)^2$, $x \in R$, prove that $f(x+1) - f(x) = 4x^3$ **(3)**

(ii) Define Bijective function. If $f: R \to R$, $f(x) = x + 1$, show that f is bijective. **(4)**

(b) Let $f(x) = x + 2$, $g(x) = x - 2$, $h(x) = 3x$, for $x \in R$, where R is the set of real numbers. Find (i) $g \circ f$ (ii) $f \circ g$ (iii) $f \circ f$ (iv) $h \circ g$ (v) $f \circ h$ (vi) $h \circ f$ (vii) $f \circ h \circ g$ **(7)**

Q.4 **(a)** (i) If $A = \begin{bmatrix} 1 & 2 & 1 \\ 0 & 1 & -1 \\ 3 & -1 & 1 \end{bmatrix}$ then find $A^2 - 5A + 3I$. **(3)**

(ii) If $A = \begin{bmatrix} 5 & -4 & 0 \\ 2 & -2 & 1 \\ 1 & 1 & 3 \end{bmatrix}$, $B = \begin{bmatrix} -2 & 2 & 3 \\ 8 & 5 & 0 \\ 1 & 1 & -2 \end{bmatrix}$ then verify that **(4)**
$(A + B)^T = A^T + B^T$

(b) Find the inverse of matrix $A = \begin{bmatrix} 1 & 1 & 1 \\ 1 & 2 & 3 \\ 1 & 4 & 9 \end{bmatrix}$ **(7)**

OR

(a) (i) If $A = \begin{bmatrix} 3 & 7 \\ 2 & 5 \end{bmatrix}$, Find $A + A^T + A^{-1}$ **(3)**

(ii) Solve the following equations, using Cramer's rule **(4)**
$2x + 3y = 13$
$x + y = 5$

(b) Define Rank of a matrix. **(7)**
Find the rank of the matrix $A = \begin{bmatrix} 7 & -1 & 0 \\ 1 & 1 & 4 \\ 13 & -3 & -4 \end{bmatrix}$, Using row operation.

Q.5 **(a)** (i) Find the area of triangle whose vertices are $(2, 3)$, $(5, 7)$, $(-3, 4)$. **(3)**

(ii) Find the coordinates of the point which divides the points $P(8, 9)$ and $Q(-7, 4)$ internally in the ratio $2:3$ and externally in the ratio $4:3$. **(4)**

(b) Prove that the quadrilateral with vertices $(2, -1)$, $(3, 4)$, $(-2, 3)$ and $(-3, -2)$ is a rhombus. **(7)**

OR

(a) (i) Find the equation of the line having the points $(1, 2)$ and $(-2, 0)$. **(3)**

(ii) For what values of k, the lines $3x + 2y + 7 = 0$ and $2x + ky + 9 = 0$ will be perpendicular to each other ? **(4)**

(b) Find the angle between the lines $2x + y - 3 = 0$ and $x + 3y + 2 = 0$. **(7)**

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Enrolment No. /Seat No.: _____

GUJARAT TECHNOLOGICAL UNIVERSITY

BCA/MCA INTEGRATED – SEMESTER I- EXAMINATION –WINTER-2024

Subject Code: BC01001051 **Date: 03/01/2025**

Subject Name: Mathematics-1

Time:10:30 AM TO 01:00 PM **Total Marks: 70**

Instructions:

1. **Attempt all questions.**
2. **Make Suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**
4. **Use of simple calculators and non-programmable scientific calculators are permitted.**

			Marks
Q.1	**(a)**	Define the following 1. Power set 2. Cartesian Product 3. Unit Matrix 4. Transpose of a matrix 5. Domain 6. De- Morgan's laws 7. Infinite Set	**07**
	(b)	1) Explain domain, Co-domain, and range with example. (3 MARKS) 2) If A= $\begin{bmatrix}2 & 1 & 5\\3 & 0 & -5\end{bmatrix}$, B= $\begin{bmatrix}2 & 2\\8 & 3\\1 & 1\end{bmatrix}$ Find AB if it is exist. (4 MARKS)	**07**
Q.2	**(a)**	Let U={1,2,3,4,5,6,7,8,9,10,11,12,13} A = {1, 3, 5, 7} B = {5, 7, 9, 11} and C = {1, 3, 5, 7, 9, 11, 13} prove that: 1. (A∩ B) U (A ∩ C) = A ∩ (BU C) 2. (A U B)' = A' ∩ B'	**07**
	(b)	If A = $\begin{bmatrix}1 & 0 & 0\\0 & 1 & 1\\1 & 0 & 0\end{bmatrix}$, B = $\begin{bmatrix}1 & 1 & 1\\0 & 0 & 1\\1 & 0 & 1\end{bmatrix}$, Find : (a) A∨B, (b) A∧B , (c) A ⊙ B.	**07**
		OR	
	(b)	Let U = {1,2,3,4,5,6,7,8,9,10}X = {1,2,4,5,6}Y = {2,4,5,7,8}Z = {2,7,9,10} Compute using Venn diagram. X∩Z∩Y, Y'∩X', X-(Y∪ Z).	**07**
Q.3	**(a)**	Simplify Exponential function: a) $2^x - 2^{x+1}$ b) $(4)^3 \times (4)^{x+5} = (4)^{2x+12}$	**07**
	(b)	If $\begin{bmatrix}a+4 & 3b\\8 & -6\end{bmatrix} = \begin{bmatrix}2a+2 & b+2\\8 & a-8b\end{bmatrix}$ then find the value of (a-2b).	**07**
		OR	
Q.3	**(a)**	Define Rank of matrix .Find rank of following matrix. A = $\begin{bmatrix}1 & 3 & 5\\4 & 5 & 7\\2 & 6 & 10\end{bmatrix}$	**07**
	(b)	A line passing through the point(1,2) with a slope of 4. Write equation.	**07**
Q.4	**(a)**	Find the inverse of function. (i) f(x)=x+1/x (ii) f(x)=5x-7	**07**
	(b)	Find x and y if 2x-3y=15 and x+5y = -18 using Cramer's rule.	**07**

OR

Q.4 **(a)** By using the section formula, find out the coordinates of the points C that divide the line segment joining the points A(8, -3) and B(16, 5) in the internal ratio 3:1. **07**

(b) Find the distance between the points A(-1, 2) and B(2, 3). **07**

Q.5 **(a)** Simplify $\log_5(1/5)$ using logarithmic property. **07**

(b) Show that the points P(–1, 6, 6), Q(0, 7, 10) and R(–4, 9, 6) form an isosceles right triangle. **07**

OR

Q.5 **(a)** Find the area of the triangle in coordinate geometry by determinant method, whose vertices are: A(1,−2), B(−3,4), C(2,3) **07**

(b) If P (-2, 1), Q (2, 3) and R (-2, -4) are three points, find the angle between the straight lines PQ and QR. **07**

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Enrollment No./Seat No.:

GUJARAT TECHNOLOGICAL UNIVERSITY

BCA/MCA INTEGRATED - SEMESTER - I EXAMINATION - WINTER 2025

Subject Code: BC01001051 **Date: 12-12-2025**

Subject Name: Mathematics-1

Time: 10:30 AM TO 01:00 PM **Total Marks: 70**

Instructions

1. Attempt all questions.

2. Make suitable assumptions wherever necessary.

3. Figures to the right indicate full marks.

4. Use of simple calculators and non-programmable scientific calculators are permitted.

			Marks
Q.1	**(a)**	(a) Define the following terms (i) Set with example, Function, Cartesian product of sets. (ii) Coordinate Geometry, Scalar Matrix, Cardinality of Sets. (iii) De-Morgan's laws.	**07**
	(b)	Define bijective function. If $f : R \to R, f(x) = x + 2$, show that f is bijective function.	**07**
Q.2	**(a)**	If A={a,b,c,d}, B={b,c,d,g,h}, C={a,g,x,y,z} and D={b,d,x,z} then verify that $(A \times B) \cap (C \times D) = (A \cap C) \times (B \cap D)$	**07**
	(b)	In a group of 1000 people, there are 750 who can speak Hindi and 400 who can speak Bengali. How many can speak Hindi only? How many can speak Bengali? How many can speak both Hindi and Bengali?	**07**
		OR	
	(b)	Let A={1,2,3,5,6,7}, B={2,5,8,9} and C={1,4,6,10,11} then verify and represent a Venn diagram of $A \cap (B \cup C) = (A \cap B) \cup (A \cap C)$	**07**
Q.3	**(a)**	(i) is of 04 marks and (ii) is of 03 marks (i) Let $f(x) = x^3$ and $g(x) = 2x + 3$, then find $(f + g)(x), (f - g)(x), (f.g)(x) and (f/g)(x)$ (ii) If $g(x) = 5x + 2$ and $g(x) = 17$, then find the value of x?	**07**
	(b)	(i) is of 03 marks and (ii) is of 04 marks (i) If $f(x) = x^2(x-1)^2, x \in R,$ prove that $f(x+1) - f(x) = 4x^3$ (ii) Define followings (a) Even and odd functions with examples (b) One-one and onto functions with examples	**07**
		OR	

(a) (i) is of 03 marks and (ii) is of 04 marks. **07**

(i) If the cost function of a commodity is $C(x) = 1200 - 45x + 2x^2$, find the total cost for producing 25 units.

(ii) If the function $f : R \to R$ be given by $f(x) = x^2 + x$ and $g : R \to R$ is given by

$g(x) = \dfrac{x}{x+1}$. Find fog and gof.

(b) **07**

If $log(\dfrac{a+b}{2}) = \dfrac{1}{2}(loga + logb)$, then show that a=b.

Q.4 **(a)** **07**

If $A = \begin{bmatrix} 1 & 3 \\ 2 & 4 \end{bmatrix}$ and $B = \begin{bmatrix} -2 & 3 \\ 1 & 1 \end{bmatrix}$. then prove that $(AB)^T = B^T A^T$.

(b) Find the inverse of the matrix **07**

$$\begin{bmatrix} 4 & 3 & 8 \\ 6 & 2 & 5 \\ 1 & 5 & 9 \end{bmatrix}$$

OR

(a) Use Cramer's rule to solve the equations **07**

$3x + 4y = -14$

$-2x - 3y = 11$

(b) Define Rank of a matrix. Find the rank of the matrix **07**

$$\begin{bmatrix} 1 & 2 & 3 \\ 2 & 3 & 4 \\ 3 & 5 & 7 \end{bmatrix}$$ using determinant method.

Q.5 **(a)** Prove that (-1,0), (0,3),(3,2) and (2,-1) are the vertices of square by using distance formula. **07**

(b) Find the angle between the lines $2x + y - 3 = 0$ and $x + 3y + 2 = 0$. **07**

OR

(a) Find the coordinates of the point which divides the points A(8, -3) and (16,5) in the internal ratio 3:1 and externally in the ratio 4:3. **07**

(b) Find equation of the line passing from (7,-4) and (2,4). Find slope and intercepts. **07**

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