GUJARAT UNIVERSITY
5 Years Integrated M.Sc. (Computer Science)
Semester: I
Mathematics: Mathematical Foundations

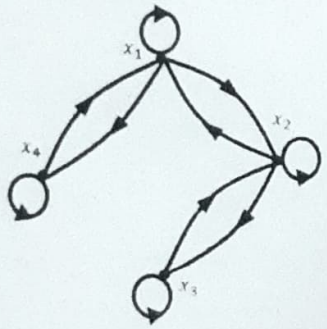
Total Marks:30 **Date:14/10/2022**

Q:1 Define the following terms with example: (Any Four) **[4]**

1) Null Set
2) Cartesian Product
3) Power Set
4) One-One Function
5) Constant Function

Q:2 Answer any Two: (Any Five) **[10]**

1) Let $A = \{1,2,3\}$, $B = \{a, b, c, d\}$ and $f = \{(1, a), (1, b), (2, d), (3, c)\}$. State whether the given function f is One-one, Onto, Bijective.
2) Find $\lim_{x \to 0} \frac{x^3 - 3x^2 + x}{4x^3 - 5x^2 + 3x}$
3) If $f: R \to R$ and $f(x) = x^2 + 2$. Check whether f is continuous at 2.
4) Write the relation as a set of ordered pairs from the direct graph as shown in below figure



5) If $A = \{1,2\}, B = \{2,3\}, C = \{3,5\}$ then find $(A \times B) \cup (A \times C)$.
6) Given S = {1,2,3,4, ... ,10} and a relation R on S where R = { x, y ; x + y = 10} then draw the diagraph.
7) Describe the following sets in set-builder form.
   $A = \{2,4,6,8,10\}$ and $B = \{3,5,7,9, \ldots, 87,89\}$.
8) Let $A = \{1,2,3,4\}$ and $B = \{a, b, c, d\}$ and let $f = \{(1, a), (2, a), (3, d), (4, c)\}$ then show that f^{-1} is not a function.

Q:3 Answer any Two: (Any Four) **[16]**

1) Find $\left\lfloor\frac{3}{2}\right\rfloor$, $\left\lfloor\left(\frac{3}{2}\right)^2\right\rfloor$, $\left(\left\lfloor\frac{3}{2}\right\rfloor\right)^2$ and $\left\lceil\frac{3}{2}\right\rceil$.

2) Prove the following statement using Venn diagram.

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

3) Show that the mapping $f: R \to R$ be defined by $f(x) = ax + b$; where $a, b, x \in R$, $a \neq 0$ is invertible. Define its inverse.

4) Consider $A = B = C = R$ and let $f: A \to B$ and $g: B \to C$ be defined by $f(x) = x + 9$ and $g(y) = y^2 + 1$ then find

a) $(fof)(a)$

b) $(fog)(-3)$

c) $(gof)(b)$

d) $(gog)(3)$.

5) If U = {1, 2, 3, 4, 5, 6, 7, 8, 9. 10}, A = {1, 3, 5, 7, 9}, B = {1, 5, 6, 8}, C = {1, 4, 6, 7} then verify

(a) $A - B = A \cap B'$ (b) $A \Delta B = B \Delta A$

6) Find $\lim_{x \to 1} \frac{x^4 - 7x^3 + 8x^2 - 3x + 1}{3x^4 - 5x^3 + 6x^2 - 10x + 6}$.

BEST OF LUCK

GUJARAT UNIVERSITY

M.Sc. (Artificial Intelligence & Machine Learning) - Defense Specific

Semester – I

Sessional - I

Subject Name: Mathematical Foundation

Time : 1.5 Hours **Total Marks : 40**

Date: 18-10-22

Q-1 In a survey it was found that 21 people liked product A, 26 liked product B and 29 liked product C. If 14 people liked products A and B, 12 people liked products C and A, 14 people liked products B and C and 8 liked all the three products. Find how many liked product C only. [5]

Q-2 Given 3 distinct non-collinear points in 2-D cartesian coordinates, find the equation to calculate the area of a triangle. [5]

OR

Q-2 Find the normal form of equation of line if the following information is given: (i) Length of perpendicular (normal) from origin to line (ii) Angle which normal makes with positive direction of x-axis.

Q-3 Line through the points (–2, 6) and (4, 8) is perpendicular to the line through the points (8, 12) and (x, 24). Find the value of x. [5]

Q-4 Find the projection of vector (b+c) on vector a, where a=2i-2j+k, b=i+2j-2k, and c=2i-j+4k [5]

Q-5 If a=2i+2j+3k, b=–i+2j+k, and c=3i+j are such that a+λb is perpendicular to c, then find the value of λ. [5]

Q-6 Show that the points A (1, – 2, – 8), B (5, 0, –2) and C (11, 3, 7) are collinear, and find the ratio in which B divides AC. [5]

Q-7 What is the span of vectors: A (2,1,1), B (1,2,1), and C (0,0,5) [5]

OR

Q-7 Check whether the following set B is a basis for R^3.
B= {(1,2,1), (-1,1,0), (5, -1,2)}

Q-8 A set B = $\{b_1,b_2\}$ given by B = {(5,-2),(1,4)} forms a basis for R^2 and a point P under this basis B is given by P=($0.5b_1 + 2b_2$). What would be the coordinates of this point P under standard basis given by $\{e_1,e_2\}$ = {(1,0),(0,1)}. [5]