

Enrollment No./Seat No.:

**GUJARAT TECHNOLOGICAL UNIVERSITY**  
**BCA/MCA INTEGRATED - SEMESTER - II EXAMINATION - SUMMER 2025**

**Subject Code: BC02001051**

**Date: 10-06-2025**

**Subject Name: Mathematics-2**

**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.

- |   | <b>Marks</b> |  |
|---|--------------|--|
| <b>Q.1 (a)</b> Show that $(p \rightarrow (q \vee r)) \equiv ((p \rightarrow q) \vee (p \rightarrow r))$   | <b>07</b>    |  |
| <b>(b)</b> Define Tautology and Show that the compound proposition is Tautology.<br>$\sim (p \wedge q) \Leftrightarrow ((\sim p) \vee (\sim q))$  | <b>07</b>    |  |
| <b>Q.2 (a)</b> Find the Disjunctive normal form for the formula<br>$(\sim p \vee q) \rightarrow (p \Leftrightarrow q)$  | <b>07</b>    |  |
| <b>(b)</b> State Baye's Theorem and In a certain assembly plant, three machines X, Y&Z make 30%,45% & 25% respectively of the products. It is known from the past experience that 2%, 3% & 2% of the products made by each machine respectively are defective. Now, suppose that a finished product is randomly selected. What is the Probability that it is defective? | <b>07</b>    |  |
| <b>OR</b>   |              |  |
| <b>(b)</b> If $A = \{1,2\}$ , $B = \{1,2,C\}$ , $C = \{a,b,c\}$ then Prove that   | <b>07</b>    |  |
| <ol style="list-style-type: none"><li>1. <math>(A \cap B) \times C = (A \times C) \cap (B \times C)</math></li><li>2. <math>(A \cup B) \times C = (A \times C) \cup (B \times C)</math></li></ol>   |              |  |
| <b>Q.3 (a)</b> Define Extended pigeonhole principle and using it Show that any 30 people are selected then at least 5 people must have been born on the same day of the week.   | <b>07</b>    |  |
| <b>(b)</b> A Menu card in a restaurant displays four soups, five main courses, three desserts and five beverages. How many different menus can a customer select if   | <b>07</b>    |  |
| <ol style="list-style-type: none"><li>1. 1) He selects one item from each group without omission.</li><li>2. 2) He chooses to omit the beverages but selects one each from the other groups.</li><li>3. 3) He chooses to omit the desserts but decides to take a beverage and one item each from the remaining groups.</li></ol>  |              |  |

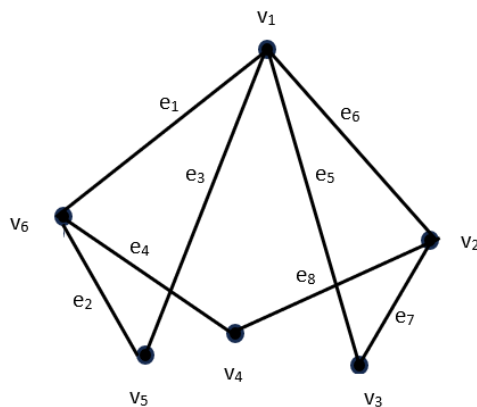
OR

- (a) 1) A box contains 6 red balls, 4 white balls, 5 black balls. A person draws 4 balls from the box at random find the probability that among the balls drawn there is at least one ball of each color. 07
- 2) A card is drawn from a well shuffled deck of 52 cards and then second card is drawn, find the probability that one card is a spade and then second card is club if the first card is not replaced.

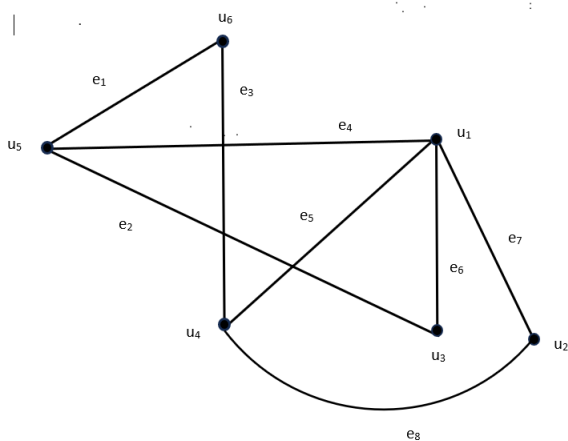
- (b) Define Combination. Then Show that 07
- $$n_{c_1} + 6(n_{c_2}) + 6(n_{c_3}) = n^3$$

- Q.4 (a) Explain the following terms with proper illustration. 07
1. 1) Mixed graph
  2. 2) Multiple graph
  3. 3) Simple Graph
  4. 4) Path

- (b) Define Isomorphic graphs. Determine whether the following graphs are Isomorphic or not. 07



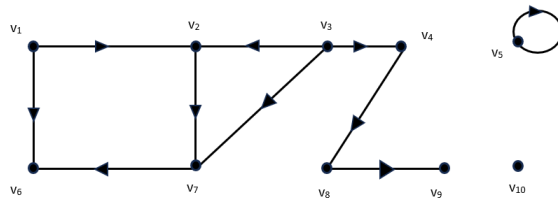
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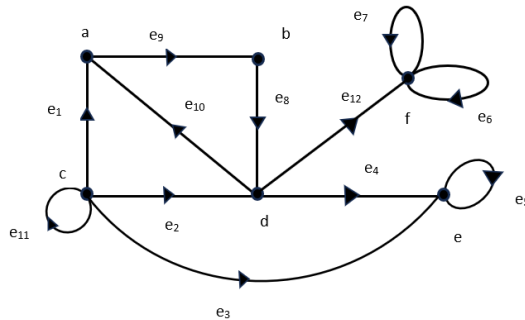
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OR

- (a) Define Reachable set of a Vertex. Find all the Reachable set of a vertex. 07



- (b) Find the Indegree, Outdegree and total degree of each vertex in the given graph. 07



- Q.5 (a) Show that  $(P(s), \subseteq)$  is Poset. 07

- (b)  $A = \{1,2,4,8\}$   $a R b$  iff  $a/b$  (a divides b) then find the digraph of relation and relation matrix. 07

OR

- (a) Let  $X = \{1,2, \dots, 7\}$  and  $R = \{(x,y) \mid x - y \text{ is divisible by } 3\}$  Show that R is equivalence relation. 07

- (b) Let  $S_8 = \{1,2,4,8\}, S_{15} = \{1,3,5,15\}, S_{30} = \{1,2,3,5,6,10,15,30\}$   
 Draw the Hasse diagram of  $(S_8, D)$ ,  $(S_{15}, D)$  &  $(S_{30}, D)$ , where D denotes the relation "divides". 07

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Enrollment No./Seat No.:

**GUJARAT TECHNOLOGICAL UNIVERSITY**  
**BCA/MCA INTEGRATED - SEMESTER - II EXAMINATION - WINTER 2025**

**Subject Code: BC02001051**

**Date: 05-12-2025**

**Subject Name: Mathematics-2**

**Time: 02:30 PM TO 05:00 PM**

**Total Marks: 70**

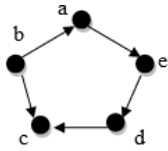
**Instructions**

- 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.**

	<b>Marks</b>
<b>Q.1 (a)</b> Explain the connectives in detail with suitable example.	<b>07</b>
<b>(b)</b> Explain the concept of duality in context to mathematical Logic with example.	<b>07</b>
<b>Q.2 (a)</b> Construct the truth table for the following statements.	<b>07</b>
(i) $\neg p \wedge \neg q$ (ii) $\neg (p \wedge \neg q)$ (iii) $(p \vee q) \vee \neg q$ (iv) $(\neg p \rightarrow r) \wedge (p \leftrightarrow q)$	
<b>(b)</b> Verify whether the following compound propositions is tautology or not: $((p \rightarrow q) \wedge (q \rightarrow r)) \rightarrow (p \rightarrow r)$	<b>07</b>
<b>OR</b>	
<b>(b)</b> Explain the Basic Counting Principles.	<b>07</b>
<b>Q.3 (a)</b> Explain the pigeonhole Principle in detail with example.	<b>07</b>
<b>(b)</b> In how many ways 6 children can be arranged in a line, such that:	<b>07</b>
(i) Two particular children of them are always together.	
(ii) Two particular children of them are never together.	
<b>OR</b>	
<b>(a)</b> Explain the partially ordered set with example.	<b>07</b>
<b>(b)</b> Nitin has 5 friends. In how many ways can he invite one or more of them to his party?	<b>07</b>
<b>Q.4 (a)</b> Explain the properties of binary relation on a set with example.	<b>07</b>
<b>(b)</b> Given the set $A = \{1, 2, 3, 4, 5\}$ and the relation $R = \{(1, 2), (2, 3), (3, 4), (4, 5)\}$ , represent this relation using a graph and an adjacency matrix.	<b>07</b>
<b>OR</b>	
<b>(a)</b> Show that the relation R is an equivalence relation in the set $A = \{1, 2, 3, 4, 5\}$ given by the relation $R = \{(a, b) :  a-b  \text{ is even}\}$ .	<b>07</b>
<b>(b)</b> Differentiate between the Permutation and Combination.	<b>07</b>
<b>Q.5 (a)</b> Explain the isomorphic graph and sub graph in detail with example.	<b>07</b>

(b) Find the in degree, Out degree and total degree for the given graph:

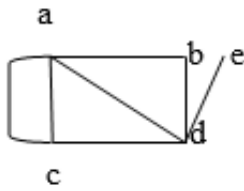
07



OR

(a) Find vertices, edges, parallel edges, loops and degree of vertices from the following Graph:

07



(b) Explain the strongly, weakly and unilaterally connected graphs with example.

07

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