

DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY, LONERE

Regular and Supplementary Winter Examination – 2024

Branch : Computer Engineering/Computer Science Engineering and Allied

Course: B.Tech

Semester : III

Subject Code & Name: BTCOC302 Discrete Mathematics

Max Marks: 60

Date: 07/02/2025

Duration: 3 Hr.

Instructions to the Students:

1. Each question carries 12 marks.
2. Question No. 1 will be compulsory and include objective-type questions.
3. Candidates are required to attempt any four questions from Question No. 2 to Question No. 6.
4. The level of question/expected answer as per OBE or the Course Outcome (CO) on which the question is based is mentioned in () in front of the question.
5. Use of non-programmable scientific calculators is allowed.
6. Assume suitable data wherever necessary and mention it clearly.

(Level Marks
/ CO)

Q. 1 Objective type questions. (Compulsory Question)

12

1	What does $P(A \cup B)$ represent in set theory?				1
	a. Union of sets A and B	b. Intersection of sets A and B	c. Difference between sets A and B	d. Complement of sets A and B	
2	If the final column of a truth table of a given statement formula has all "F" then it is called _____				1
	a. Contradiction	b. Tautology	c. Negation	d. none of the above	
3	The cardinality of the Power set of the set $\{1, 5, 6\}$ is_____.				1
	a. Five	b. Six	c. Seven	d. Eight	
4	A relation R in a set A is called _____, if $(a_1, a_2) \in R$ implies $(a_2, a_1) \in R$, for all $a_1, a_2 \in A$.				1
	a. Transitive	b. Symmetric	c. equivalence	d. iterative	
5	If $f : A \rightarrow B$ and $g : B \rightarrow C$ be the bijective functions. Then $(g \circ f)^{-1}$ is _____				1
	a. $f^{-1} \circ g^{-1}$	b. $g \circ f$	c. $g^{-1} \circ f^{-1}$	d. $f \circ g$	
6	The graph in which, there is a closed trail which includes every edge of the graph is known as?				1
	a. Hamiltonian graph	b. Euler graph	c. Directed graph	d. Planar graph	

7	A simple graph has _____					1
	a. Loops	b. Parallel edges	c. Both a & b	d. None of the mentioned		
8	It is called a leaf if it has _____ children?					1
	a. One	b. Two	c. Multiple	d. No		
9	The vertex which is reachable from u is called _____ of u.					1
	a. Son	b. Root	c. Descendant	d. Simple vertex		
10	Which of the following is the algorithm to find the minimum spanning tree of the given graph?					1
	a. Both b & c	b. Prim's Algo.	c. Kruskal's Algo.	d. None of the mentioned		
11	Field will be formed from the _____ algebraic structures.					1
	a. $(C,+, \times)$	b. $(Q,+, \times)$	c. $(R,+, \times)$	d. $(Z,+, \times)$		
12	The ring $(S, +, \cdot)$ is called a ring with identity if (S, \cdot) is _____					1
	a. Commutative	b. Monoid	c. Semi group	d. Satisfy associative property		

(Level / Marks
CO)

Q. 2 Solve the following.

A) Using Venn Diagrams Prove that-

$$1. [A - (B - C)] = (A - B) \cup ((A \cap B) \cap C).$$

$$2. [A \cap (B \ominus C)] = (A \cap B) \ominus (A \cap C).$$

B) Out of 120 students surveyed; it was found that 20 students have studied French, 50 students have studied English, 70 students have studied Hindi, 5 studied English and French, 20 have studied English and Hindi, 10 have studied Hindi and French, only 3 students have studied all the three languages. Find how many students have studied –

- 1) Hindi alone,
- 2) French alone,
- 3) English but not Hindi.
- 4) Hindi but not French.

(Level / CO) Marks

Q.3 Solve the following.

12

A) Let $A=B=C=D \in \mathbb{R}$, Also $f : A \rightarrow B$, $g : B \rightarrow C$ and $h : C \rightarrow D$ where $f(a) = a+1$, $g(b) = b^2+2$, $h(c) = 7c-2$. Find

CO2

6

- 1) $g \circ f(-2)$ 2) $f \circ g(-2)$ 3) $g \circ f(a)$

B) Find the inverse of :

CO2

6

- 1) $f(x) = (x-3) / 2$
2) $f(x) = (3x+2) / (4x-1)$

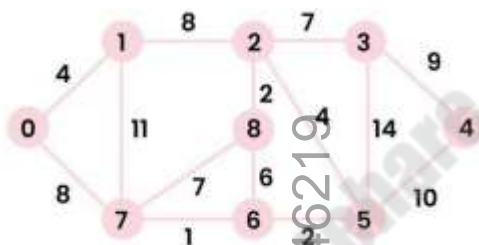
Q. 4 Solve Any Two of the following.

12

A) Find the shortest path between 0 to 4 using Dijkstras Algorithm in the weighted graph displayed in Figure below.

CO3

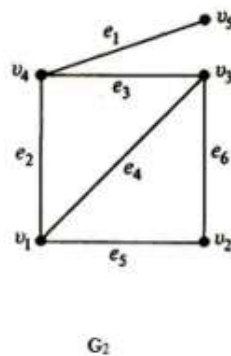
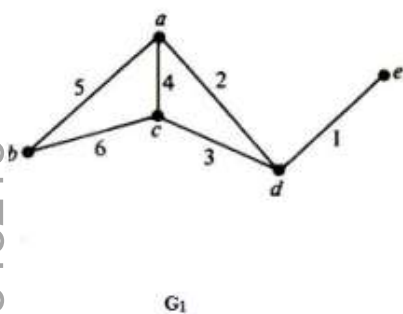
6



B) What is isomorphic Graphs. Prove that the following graphs are Isomorphic graph.

CO3

6



C) Write a short note on Hamiltonian path, Hamiltonian Circuit and Hamiltonian Graph with suitable example.

CO3

6

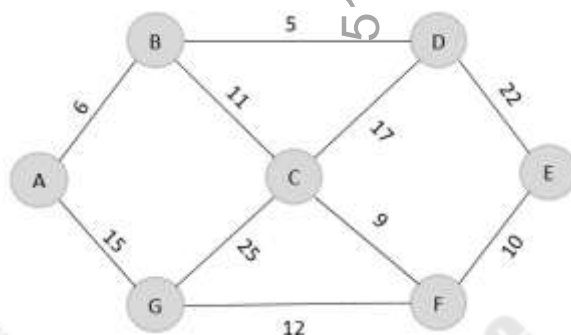
	(Level / CO)	Marks
Q.5 Solve Any Two of the following.		12

- A) Construct a Binary Search Tree from its following Pre-Order and In-Order Traversal.

Pre-Order Traversal : F B A D C E G I H

In-Order Traversal : A B C D E F G H I

- B) Find the Minimal spanning tree (MST) for the given graph using Kruskal's Algorithm



- C) Explain the Concept of Binary Search Tree and complete Binary Search Tree with suitable example. Also Explain deleting a node in binary search tree which have two Childs.

Q. 6 Solve Any Two of the following.

- A) What are Binary Operations? Explain its five properties with suitable example.
- B) If $G = \{ 0, 3, 6, 9, 12 \}$, check whether G under addition modulo 15 ie $(G, +_{15})$ is an abelian group or not?
- C) Define and Explain-

1) Semi Groups

2) Monoids

3) Integral Domain

*** End ***