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SET - I

## CMR INSTITUTE OF TECHNOLOGY: HYDERABAD

UGC AUTONOMOUS

B.Tech. IV – Semester- I - Mid Term Examinations – April – 2024

DISCRETE MATHEMATICS AND GRAPH THEORY

(Common to CSE, CSM, CSD, CSC &amp; AIM)

[Time: 120 Minutes]

[Max. Marks: 30]

- Note: 1. This question paper contains two parts A and B.  
 2. Part A is compulsory which carries 5 marks. Answer all questions in Part A.  
 3. Part B consists of 5 questions. Answer all 5 questions. Each question carries 5 marks  
 4. Illustrate your answers with NEAT sketches wherever necessary.

## PART-A

5 x 1M=5M

S. No.	Question	BTL	CO	PO
1	a Write the dual of $q \rightarrow p$ .	3	1	1,2,12
	b Define Tautology.	1	1	1,2,12
	c Define Modus Tollens formula.	2	2	1,2,12
	d Write the Minterms for two variables.	1	2	1,2,12
	e Find all subsets of $\{3, 7\}$ .	1	3	1,2,12

## PART-B

5 x 5M=25M

S. No.	Question	BTL	CO	PO
2	Construct the truth table for the compound proposition $(p \wedge q) \rightarrow (\neg r)$	2	1	1,2,12
3	Prove the following result: $\neg[\{(p \vee q) \wedge r\} \rightarrow \neg q] \Leftrightarrow \neg[\neg\{(p \vee q) \wedge r\} \vee \neg q] \Leftrightarrow q \wedge r$	2	1	1,2,12
4	Prove that, for any propositions p, q, r, the compound proposition $[(p \rightarrow q) \wedge (q \rightarrow r)] \rightarrow (p \rightarrow r)$ is a tautology.	1	1	1,2,12
5	For any propositions p, q, prove the following: (i) $\neg(p \downarrow q) \Leftrightarrow (\neg p \uparrow \neg q)$ (ii) $\neg(p \uparrow q) \Leftrightarrow (\neg p \downarrow \neg q)$	1	1	1,2,12
6	Obtain the principal conjunctive normal form of the formula $(\neg p \rightarrow r) \wedge (q \leftrightarrow p)$	2	2	1,2,12

7	Show that the premises $p \rightarrow q, p \rightarrow r, q \rightarrow \neg r, r$ are consistent.	2	2	1,2,12
8	Show that $s \vee r$ is tautologically implied by $(p \vee q) \wedge (p \rightarrow r) \wedge (q \rightarrow s)$	3	2	1,2,12
9	Prove by the mathematical induction that sum of first $n$ natural numbers is $\frac{n(n+1)}{2}$ .	3	2	1,2,12
10	If $U = \{1, 2, 3, 4, 5, 6, 7, 8, 9\}$ , $A = \{1, 2, 4, 6, 8\}$ and $B = \{2, 4, 5, 9\}$ compute the following: $\bar{A}, \bar{B}, \bar{A} \cup \bar{B}, \bar{A} \cap \bar{B}, \bar{A} \cap \bar{B}, \bar{A} \cup \bar{B}, A - B, B - A, A \Delta B.$	2	3	1,2,12
11	For any two sets A, B prove the commutative laws: (i) $A \cup B = B \cup A$ (ii) $A \cap B = B \cap A.$	2	3	1,2,12