



Mahindra University Hyderabad
École Centrale School of Engineering
Mid-Semester exam

Program: B. Tech. Branch: CSE Year: I Semester: II
Subject: Discrete Mathematics (CS1202)

Date: 20-4-2022
Time Duration: 1.5 Hours

Start Time: 9.00 AM
Max. Marks: 40

Instructions:

- 1) *Attempting all the questions is mandatory.*
- 2) *Each question carries different marks as shown beside the respective question.*

1. Answer the following questions: (8 Marks)
 - a. Using the standard rules of inference, Write the series of steps to show that the premises $r \rightarrow s$, $p \rightarrow q$, and $r \vee p$, will lead to conclusion $s \vee q$.
 - b. Let p , q and r be the propositions; p : Candidate is known to be corrupt, q : Candidate is elected, r : Candidate is kind. Express the following statements 'S1' and 'S2' using propositions p , q and r . Determine whether statement 'C' logically follows from 'S1' and 'S2' as per inference rules of logic.
S1: If a candidate is known to be corrupt, then he will not be elected.
S2: If a candidate is kind, he will be elected.
C: If a candidate is kind, he is not known to be corrupt.
2. Answer the following questions: (8 Marks)
 - a. Obtain the principal disjunctive normal form and principal conjunctive normal form of biconditional formula $P \leftrightarrow Q$ considering its truth table.
 - b. Let $S = \{1, 2, 3, \{a\}, \{b\}, \{a, b, c\}, \emptyset\}$. Answer in True or False
 - i. $\{a\} \subseteq S$
 - ii. $\emptyset \in S$
 - iii. $\emptyset \subseteq S$
 - iv. $\{\emptyset\} \subseteq S$
3. Answer the following questions (8 Marks)
 - a. For the poset $(\{3, 5, 9, 15, 24, 45\}, |)$.
 - i. Find all upper bounds of $\{3, 5\}$.
 - ii. Find the least upper bound of $\{3, 5\}$, if it exists.
 - iii. Find all lower bounds of $\{15, 45\}$.

- iv. Find the greatest lower bound of $\{15, 45\}$, if it exists.
- b. Write any two compatible total orderings for the poset $(\{1, 2, 4, 5, 12, 20\}, |)$

4. How many vertices and how many edges (in terms of m & n) do the following graphs have? (6 Marks)

- a) K_n (Complete graph)
- b) C_n (Cycle graph)
- c) $K_{m,n}$ (Complete bipartite graph)

5. Answer the following questions (10 Marks)

a) What is the chromatic number of an n -vertex simple connected graph which does not contain any odd length cycle? Assume $n \geq 2$.

- (A) 2
- (B) 3
- (C) $n-1$
- (D) n

b) Consider a simple undirected graph of 10 vertices. If the graph is disconnected, What is the maximum number of edges it can have ?

