



Mahindra University Hyderabad
École Centrale School of Engineering
End-semester Regular/Supplementary Examination

Program: B. Tech. Branch: CSE/AI Year: I Semester: II
Subject: Discrete Mathematics (CSE/AI 1202)

Date: 09-06-2022
Time Duration: 3 Hours

Start Time: 8.30 AM
Max. Marks: 80

Instructions:

- 1) Attempting all questions is mandatory.
- 2) All questions carry equal marks.
- 3) All sub-questions of a question must be answered at one place in your answer booklet.

1. Answer the following questions (6+4+6 Marks)

A) Using the standard rules of inference, show that the following premises

1. "If you send me an e-mail message, then I will finish writing the program,"
2. "If you do not send me an e-mail message, then I will go to sleep early,"
3. "If I go to sleep early, then I will wake up feeling refreshed"

will lead to the conclusion "If I do not finish writing the program, then I will wake up feeling refreshed."

B) What is the limitation of propositional logic? Explain how predicate logic (using predicates and quantifiers) will help overcome the limitations of propositional logic.

C) Express the following english statements using quantifiers

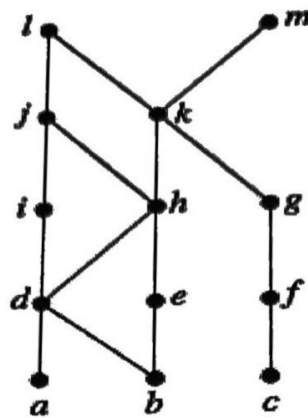
1. "All hummingbirds are richly colored."
2. "No large birds live on honey."
3. "Birds that do not live on honey are dull in color."
4. "Hummingbirds are small."

2. Answer the following questions (8+8 Marks)

A) Show that the set $G=\{1,2,3,4,5,6\}$ is a group with respect to multiplication modulo 7.

B) For the Hasse diagram below, Answer the following questions.

1. Find all upper bounds of $\{a, b, c\}$.
2. Find the least upper bound of $\{a, b, c\}$, if it exists.
3. Find all lower bounds of $\{f, g, h\}$.
4. Find the greatest lower bound of $\{f, g, h\}$, if it exists.

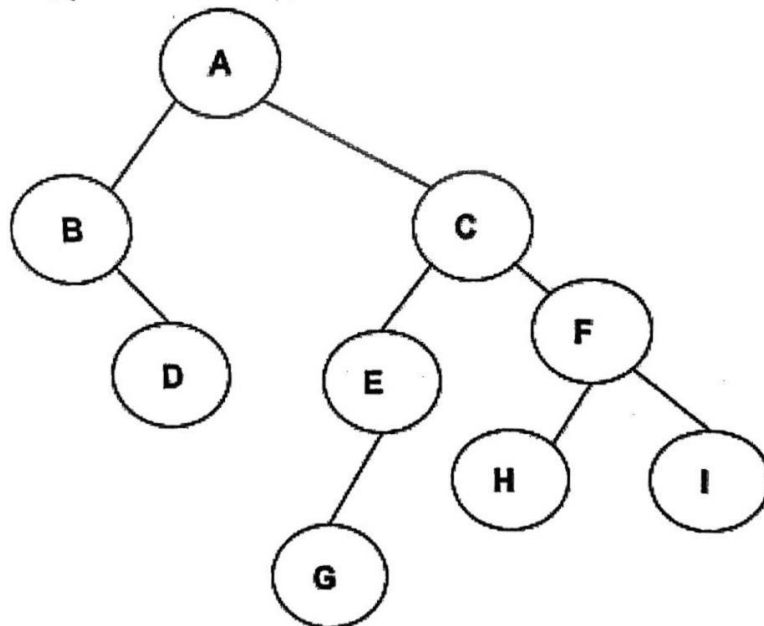


3. Answer the following questions

(5+6+5 Marks)

A) Solve the recurrence relation, $a_n = 4a_{n-1} - 4a_{n-2}$ for $n \geq 2$, $a_0 = 6$, $a_1 = 8$.

B) Write the inorder, preorder and postorder of the following tree.



C) In a binary tree, for every node the difference between the number of nodes in the left and right subtrees is at most 2. If the height of the tree is $h > 0$, then the minimum number of nodes in the tree is ___. Choose the correct answer among the following.

(a) 2^{h-1}

(b) $2^{h-1} + 1$

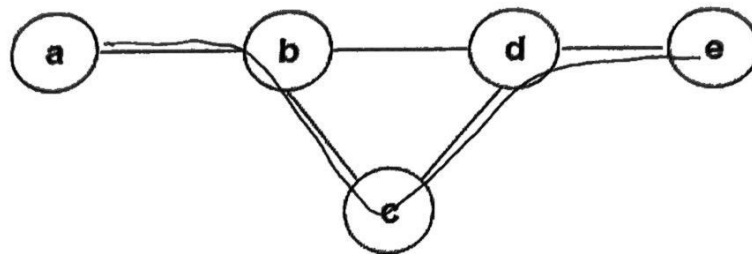
(c) $2^h - 1$

(d) 2^h

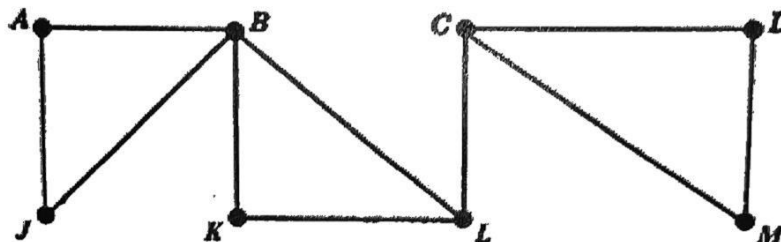
4. Answer the following questions

(6+5+5 Marks)

A) Define the Hamiltonian path of a graph. Find a Hamiltonian path (if it exists) for the following graph.



B) Consider the following graph. Find : (a) all cycles; (b) all cut vertices; (c) all cut edges.



C) Given that the graph is bipartite and has a total of 20 vertices. The maximum number of edges it can have is 100?

5. Answer the following questions.

(6+4+6 Marks)

A) How many bit strings of length eight either start with a 1 bit or end with the two bits 00? 192

B) Explain the pigeonhole principle.

C) What is the minimum number of students, each of whom comes from one of the 50 states, who must be enrolled in a university to guarantee that there are at least 100 who come from the same state?

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