Code No: G-5051/N/AICTE

FACULTY OF ENGINEERING

B.E. (CS/ CSE) III - Semester (AICTE) (Main & Backlog) (New) Examination, February/ March 2025

Subject: Discrete Mathematics

Time: 3 Hours **Max. Marks: 70**

Note: (i) First question is compulsory and answer any four questions from the remaining six questions. Each question carries 14 Marks.
(ii) Answer to each question must be written at one place only and in the same order as they occur in the question paper.
(iii) Missing data, if any, may be suitably assumed.

1. a) Show that $\sim (p \vee q)$ and $\sim p \wedge \sim q$ are logically equivalent.
   b) Define Equivalence relation. Give an example of an Equivalence relation.
   c) State Pigeonhole principle with an example.
   d) Find the generating function for the finite sequence 1, 4, 16, 64, 256.
   e) What is the Chromatic number of a Cycle graph?
   f) Give an indirect proof of the theorem if $3n + 2$ is odd, then n is odd.
   g) Differentiate between Euler Circuit and Hamiltonian Circuit.

2. a) Show that $p \vee (q \wedge r)$ and $(p \vee q) \wedge (p \vee r)$ are logically equivalent using truth table method.
   b) Show that the following argument is valid using rules of inference. "It is not sunny and it is cold. We will swim only if it is sunny. If we do not swim, then we will canoe. If we canoe, then we will be home by sunset." Therefore "We will be home by sunset"

3. a) A = {2, 3, 6, 12, 24, 36, 72} R: {(x,y) / x,y ∈ A, x divides y}. Write the partial order and draw the Hasse diagram for R and Also compute lower bounds, upper bounds, greatest lower bound, least upper bound for {2,12, 24}.
   b) Prove that $(Q^+, *)$, where * is a binary operation defined by a*b = ab/5 is a group?

4. a) Determine the number of integers between 1 to 50 inclusive that are divisible by none of 2,3, and 5.
   b) How many integral solutions are there to $x_1 + x_2 + x_3 + x_4 + x_5 = 20$ where each $x_i \geq 2$?

5. a) Solve the recurrence relation $a_n - 7a_{n-1} + 10a_{n-2} = 0$ for $n \geq 2$ with initial conditions $a_0 = 10$, $a_1 = 41$
   b) Using Generating functions solve the recurrence relation $a_k = 3a_{k-1}$ and initial condition $a_0 = 2$.

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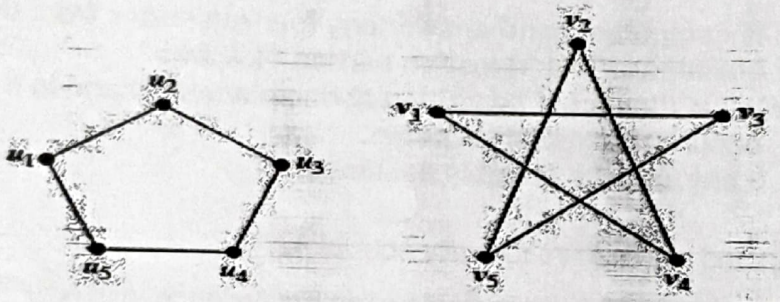
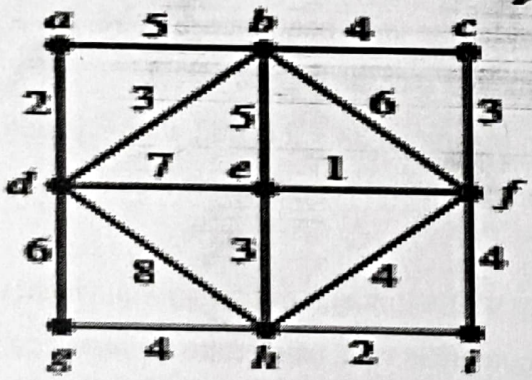
6. a) Explain various conditions for proving the given groups are isomorphic. Also determine whether the given pair of graphs is isomorphic or not? Justify your answer.



b) Use Prim's algorithm to find a minimum spanning tree for the given weighted graph.



7. a) Obtain the Principal Disjunctive Normal form of $[(P \wedge Q) \vee (\neg P \wedge R)] \vee (Q \wedge R)$.
b) Explain and illustrate Breadth First Search and Depth First Search with examples.

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