Code: **CSCS1T2**

PVP 12

I M.Tech-I Semester-Regular Examinations-April 2015

MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE (COMPUTER SCIENCE & ENGINEERING)

Duration: 3 hours Marks: 5x14=70

Answer any FIVE questions. All questions carry equal marks

1 a) Explain briefly about Propositional Logical Statements. Give the truth table of $\rightarrow$ operator. What is the difference between $\rightarrow$ and $\Longrightarrow$ symbols. 7 M

b) Define Tautological Implication. Prove that $(\neg P \wedge (P \wedge Q)) \Longrightarrow R$ 7 M

2 Define Inference Theory and explain the three rules associated with it. From the below three sentences:

i. If we have good politicians and good laws then we have good governance
ii. Either we do not have responsible citizens or we have good politicians
iii. We have good laws

Using Rule-CP, prove that: "If we have responsible citizens then we get good governance"
Hint: First convert these sentences into logical statements using propositional variables. 14 M

3 a) Define Partial Ordering, and a partial order set (Poset). 7 M

b) A relation R on set $A = \{1,2,3\}$ is given by $R = \{\langle 1,1\rangle, \langle 1,2\rangle, \langle 2,1\rangle, \langle 2,2\rangle, \langle 2,3\rangle, \langle 3,2\rangle, \langle 3,3\rangle\}$. Show that it is a compatibility relation, but not an equivalence relation. 7 M

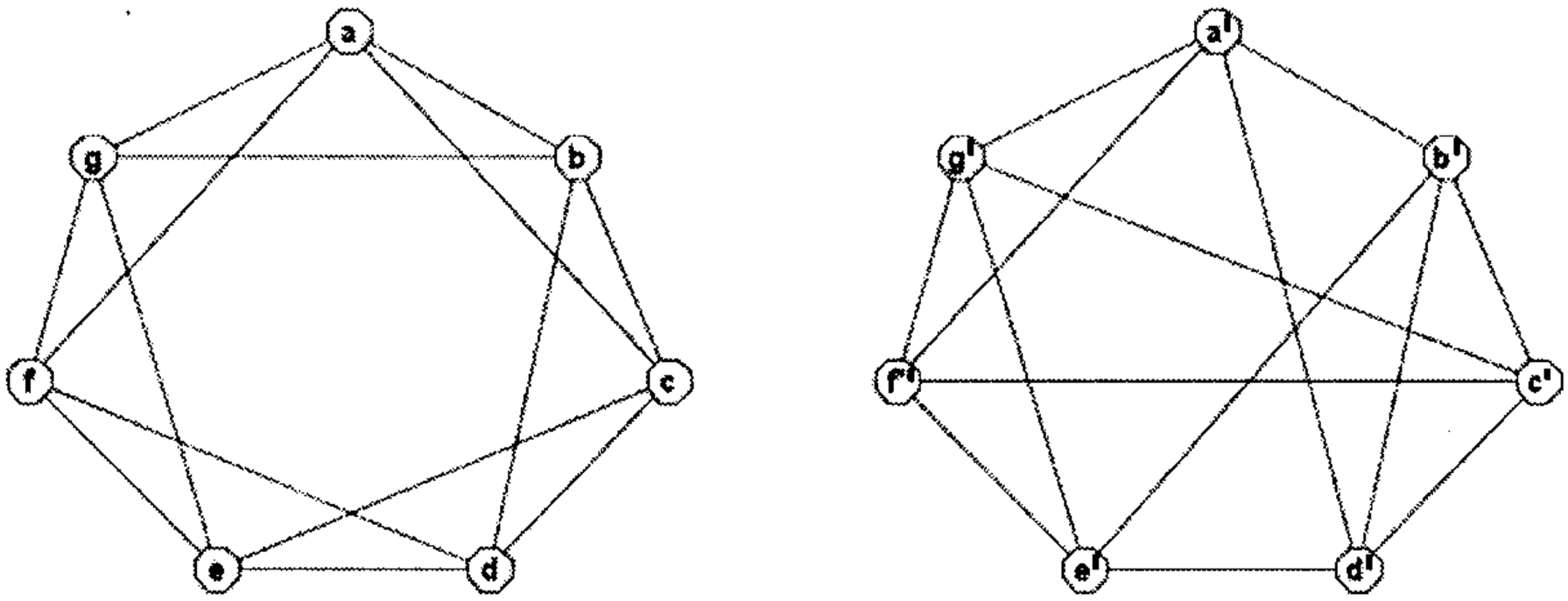
4 Let $X = \{1,2,3,4\}$ and $f: X \longrightarrow X$ be given by $f = \{\langle 1,2\rangle, \langle 2,3\rangle, \langle 3,4\rangle, \langle 4,1\rangle\}$, and the identity mapping on X be denoted by $f^0 = \{\langle 1,1\rangle, \langle 2,2\rangle, \langle 3,3\rangle, \langle 4,4\rangle\}$. Now, build a composition table for the algebraic system $\langle F, \circ\rangle$, where F is the set of composite functions $\{f^0, f^1, f^2, f^3\}$. Show that $\langle F, \circ\rangle$ is a commutative monoid. 14 M

5 a) Describe briefly about Generalization of Pigeon-hole Principle. There are 5 cargos in a shipyard and a total of 232 containers to be loaded in the cargos. Show that one of the cargos must have at least 47 containers. 7 M

b) How many distinct permutations of the letters in the word 'ENGINEERING' can be formed? 7 M

6 Solve the below recurrence relation using Characteristic Roots method.
$a_n - 7a_{n-1} + 16a_{n-2} - 12a_{n-3} = 0, \text{for } n \geq 3, \text{ with initial conditions } a_0 = 1,\ a_1 = 4,\ and\ a_2 = 8.$ 14 M

7 Define isomorphism between two graphs. Find if the two graphs, G_1 and G_2, are isomorphic. If they are isomorphic, then show how. If they are not, then explain why not. 14 M

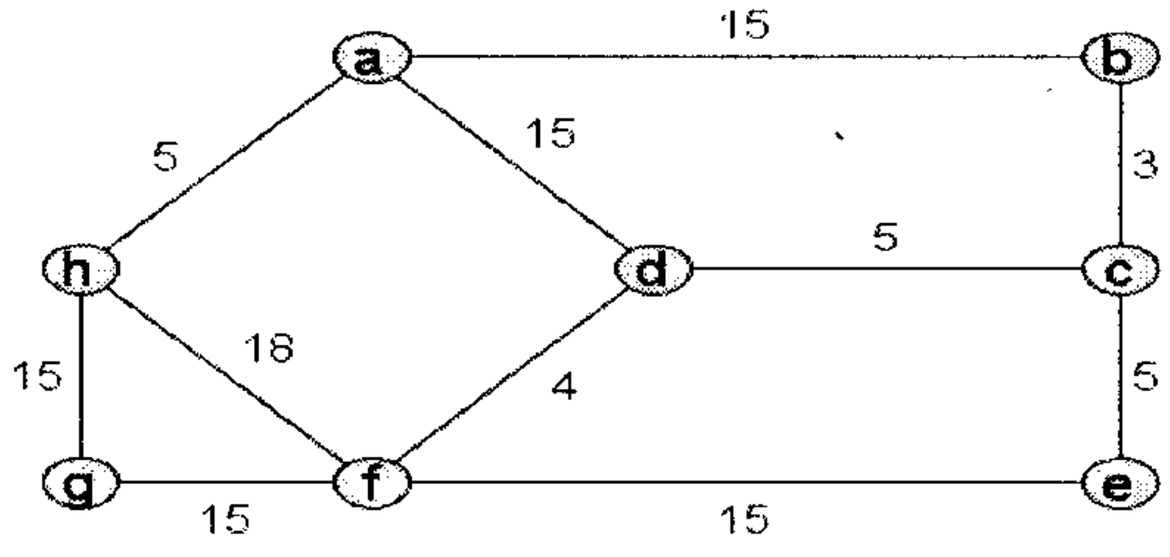


Graph G_1 Graph G_2

Fig.1

8 Briefly explain Kruskal's Algorithm for finding a minimal spanning tree. Determine a railway network (spanning tree) of minimal cost among the cities (vertices) in the below graph with the given weights.

14 M



Graph H

Fig.2