

Code: CSCS1T2

I M.Tech-I Semester-Regular Examinations-February 2016

**MATHEMATICAL FOUNDATIONS OF COMPUTER
SCIENCE
(COMPUTER SCIENCE & ENGINEERING)**

Duration: 3 hours

Max. Marks: 70

Answer any FIVE questions. All questions carry equal marks

1 In Propositional Logic, what does a *Propositional Statement* mean? Suppose that the following statements are symbolized as: 14 M

- i. It rains* : *R*
- ii. I'll be wet* : *W*
- iii. I stay at home* : *S*
- iv. Picnic is cancelled* : *P*

Translate the below English sentences into symbolized propositional statements.

- i. If it rains and the picnic is not cancelled or I don't stay at home then I'll be wet.*
- ii. Whether or not the picnic is cancelled, I'll stay at home if it rains.*
- iii. Picnic is cancelled or not, I'll not stay at home, so I'll be wet.*

- 2 a) Define Inference Theory and explain the three rules associated with it. 7 M
- b) Using indirect method of proof, and given the below set of hypotheses, prove that $\{(P \rightarrow Q), (Q \rightarrow R), \neg(P \wedge R), (P \vee R)\} \Rightarrow R$. 7 M
- 3 a) What are the different properties of set-inclusion? What is the difference between subset and a proper subset? 7 M
- b) Define Partial Ordering, and a Partial Order Set (Poset) with an example. 7 M
- 4 Let $X = \{1,2,3,4\}$ and $f: X \rightarrow X$ 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 Generating Functions method. 14 M

$$a_n - 5a_{n-1} + 6a_{n-2} = 0, \text{ where } a_0 = 1, a_1 = 5, \text{ with } n \geq 2.$$

7 Answer the following. 14 M

- a) Define Hamiltonian path, Hamiltonian cycle and Hamiltonian graph.
- b) Does Graph H have Hamiltonian path? If yes, what is that path?
- c) Does Graph H have a Hamiltonian cycle? If yes, what is that cycle?
- d) Is Graph H a Hamiltonian graph? If yes, how? If not, why not?

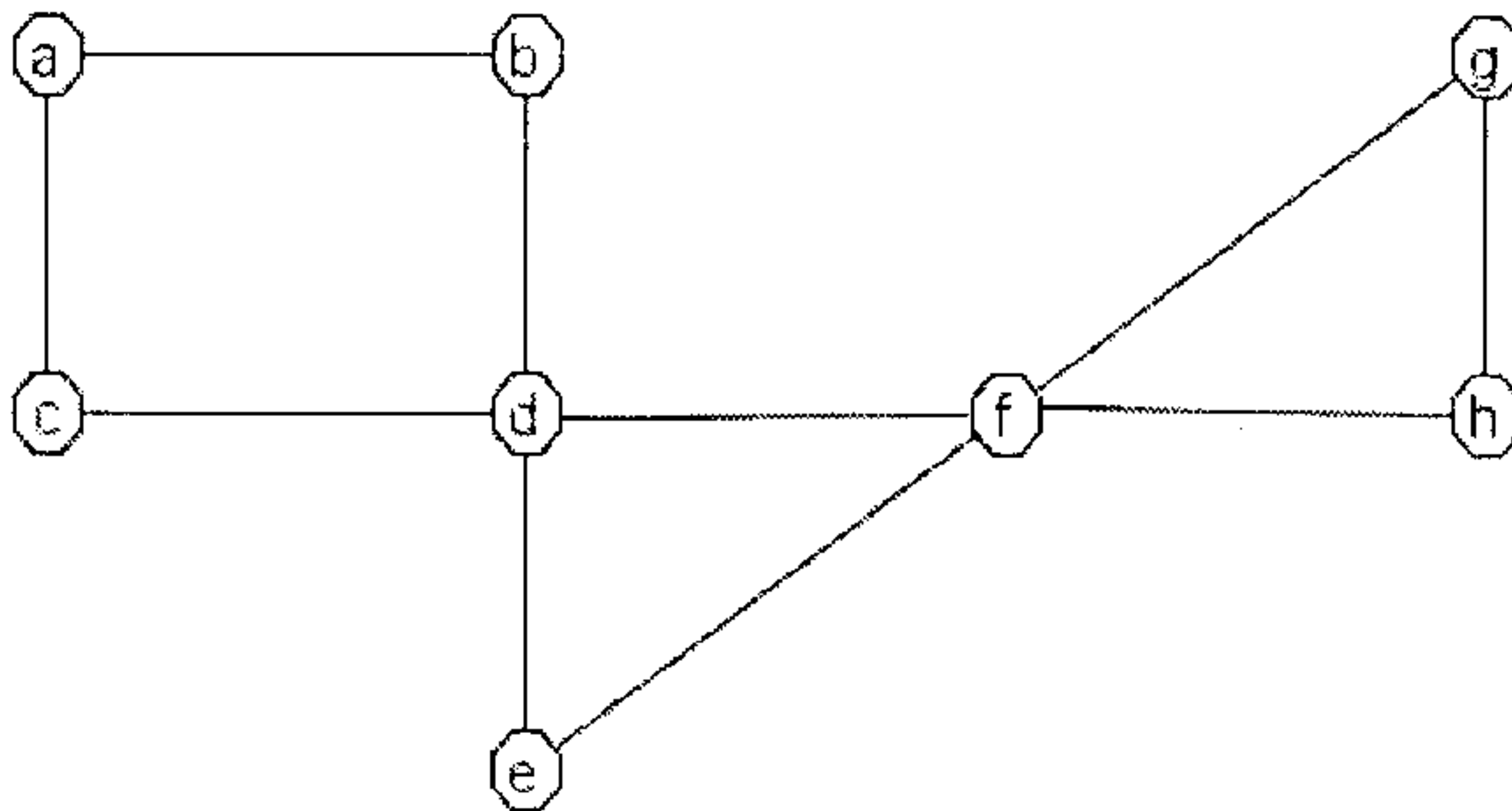


Fig.1: Graph H

8 Define Spanning Tree. Build a spanning tree for Graph G, using Breadth-First Search (BFS) algorithm. (Specify the sequence of nodes, and the root, before selecting a path to build the spanning tree)

14 M

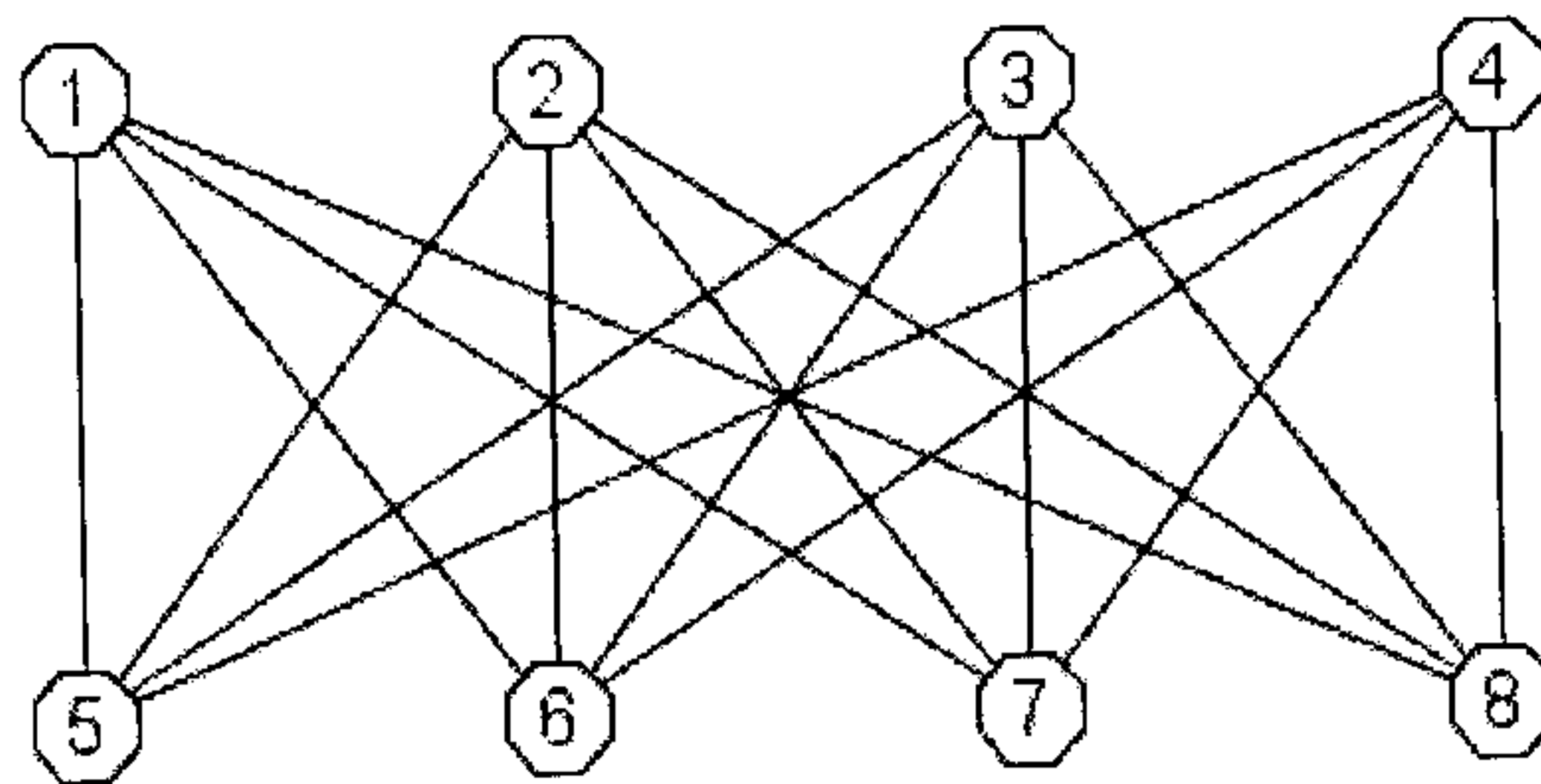


Fig.2: Graph G