

II B.Tech I Semester Regular Examinations, November 2007
MATHEMATICAL FOUNDATION OF COMPUTER SCIENCE
 (Common to Computer Science & Engineering, Information Technology
 and Computer Science & Systems Engineering)

Time: 3 hours

Max Marks: 80

Answer any FIVE Questions
 All Questions carry equal marks

1. (a) Construct a truth table for each of these (easy) compound statements
 - i. $(p \rightarrow q) \wedge (\neg p \rightarrow q)$
 - ii. $p \rightarrow (\neg q \vee r)$
 - (b) Write the negation of the following statements.
 - i. Jan will take a job in industry or go to graduate school.
 - ii. James will bicycle or run tomorrow.
 - iii. If the processor is fast then the printer is slow.
 - (c) What is the minimal set of connectives required for a well formed formula. [8+6+2]
2. Prove using rules of inference or disprove.
 - (a) Duke is a Labrador retriever
 All Labrador retriever like to swim
 Therefore Duke likes to swim.
 - (b) All even numbers that are also greater than 2 are not prime
 2 is an even number
 2 is prime
 Therefore some even numbers are prime.
 UNIVERSE = numbers.
 - (c) If it is hot today or raining today then it is no fun to snow ski today
 It is no fun to snow ski today
 Therefore it is hot today
 UNIVERSE = DAYS. [5+6+5]
 3. (a) Consider $f: \mathbb{Z}^+ \rightarrow \mathbb{Z}^+$ define by $f(a) = a^2$. Check if f is one-to-one and / or into using suitable explanation.
 - (b) What is a partial order relation? Let $S = \{x, y, z\}$ and consider the power set $P(S)$ with relation R given by set inclusion. Is R a partial order.
 - (c) Define a lattice. Explain its properties. [4+8+4]
 4. (a) If G is a group such that $(ab)^m = a^m b^m$ for three consecutive integers m for all $a, b \in G$, show that G is abelian.

- (b) Let G be a group and H a subgroup of G . Let f be an automorphism of G and $f(H) = \{f(h)/h \in H\}$
 Prove that $f(H)$ is a subgroup of G . [10+6]
5. (a) Howmany ways are there to seat 10 boys and 10 girls around a circular table, if boys and girls seat alternatively
 (b) In howmany ways can the digits 0,1,2,3,4,5,6,7,8 and 9 be arranged so that 0 and 1 are adjacent and in the order of 01. [16]
6. (a) Solve $a_n = a_{n-1} + a_{n-2}$, $n \geq 2$, given $a_0 = 1$, $a_1 = 1$ using generating functions
 (b) Solve $a_n = 3a_{n-1}$, $n \geq 1$, using generating functions. [8+8]
7. (a) Derive the directed spanning tree from the graph shown Figure 7a

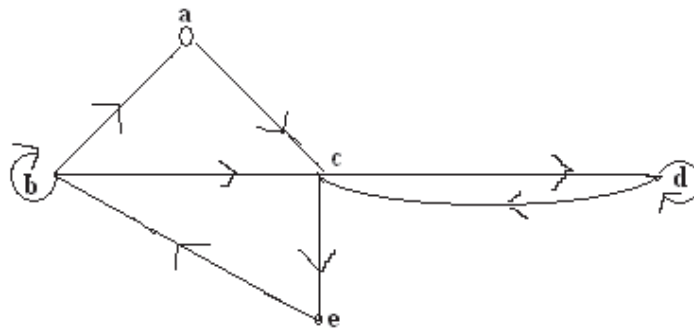


Figure 7a

- (b) Explain the steps involved in deriving a spanning tree from the given undirected graph using breadth first search algorithm. [8+8]
8. (a) Find the chromatic numbers of
 i. a bipartite graph $K_{3,3}$
 ii. a complete graph K_n and
 iii. a wheel graph $W_{1,n}$.
 (b) Find the chromatic number of the following graph. Figure 8b [16]

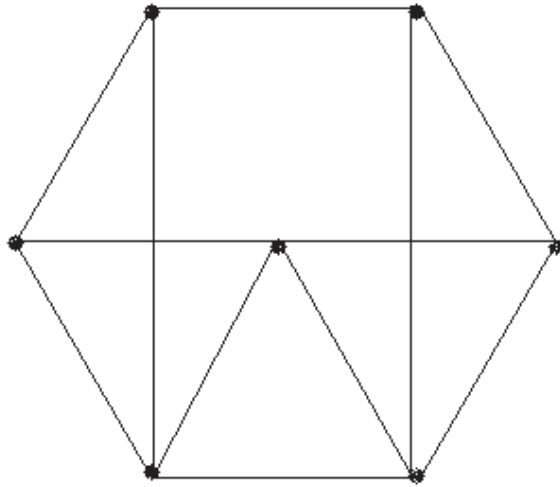


Figure 8b
