Code: CS3T1

II B.Tech - I Semester – Regular Examinations – December 2014

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) Construct the truth tables for the following formulas.   7 M
     i) $(P \wedge (P \rightarrow Q)) \rightarrow Q$
     ii) $(P \leftrightarrow Q) \leftrightarrow ((P \wedge Q) \vee {\sim}P \wedge {\sim}Q)$

   b) Show that the following implications.   7 M
     i) $(P \wedge Q) \Rightarrow (P \rightarrow Q)$
     ii) $(P \rightarrow (Q \rightarrow R)) \Rightarrow (P \rightarrow Q) \rightarrow (P \rightarrow R)$

2 a) Define Normal form and obtain PDNF for the following.
                                                   7 M
     i) ${\sim}P \vee Q$ ii) $(P \wedge Q) \vee ({\sim}P \wedge R) \vee (Q \wedge R)$

   b) Define PCNF obtain PCNF for the following.   7 M
     i) $({\sim}P \rightarrow R) \wedge (Q \leftrightarrow P)$ ii) $Q \wedge (P \vee {\sim}Q)$

3 a) Define Rule P, Rule T. Show that SVR is Tautologically
     implied by   7 M
 $(P \vee Q) \wedge (P \rightarrow R) \wedge (Q \leftrightarrow S)$

   b) Prove by mathematical induction that $6^{n+2} + 7^{2n+1}$ is
     divisible by 43 for each Positive integer n.   7 M

4 a) Write the two basic counting principles. How many different license plates are there that involve 1,2 or 3 letters followed by 4 digits? 7 M

b) How many integral solutions are there to
$$x1+x2+x3+x4+x5=20$$
where $x1 \geq 3$, $x2 \geq 2$, $x3 \geq 4$, $x4 \geq 6$ and $x5 \geq 0$? 7 M

5 a) Solve the recurrence relation $a_n - 7a_{n-1} + 16a_{n-2} - 12a_{n-3} = 0$ for $n \geq 3$ with the initial conditions $a_0 = 1$, $a_1 = 4$ and $a_2 = 8$ by the method of characteristic roots. 8 M

b) Solve the recurrence relation $a_n = a_{n-1} + f(n)$ for $n \geq 1$ by substitution. 6 M

6 a) Define equivalence relation. Let x= {1, 2,.....7} and
R= {(x,y)/(x-y) is divisible by 3}.
Show that R is a equivalence relation. Draw the graph of R. 7 M

b) Let x={2,3,6,12,24,36} and the relation $\leq$ be such that $x \leq y$ if x divides y. Draw the Hasse diagram of $(x, \leq)$. 7 M

7 a) Explain Warshall's Algorithm with Example. 7 M

b) Define directed graph and Adjacency matrix. Draw the graph for the following adjacency matrix.   7 M

$$\begin{bmatrix} 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 & 1 \\ 1 & 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{bmatrix}$$

8 a) Define isomorphism of graph. Are the two following graphs are isomorphic or not?   7 M
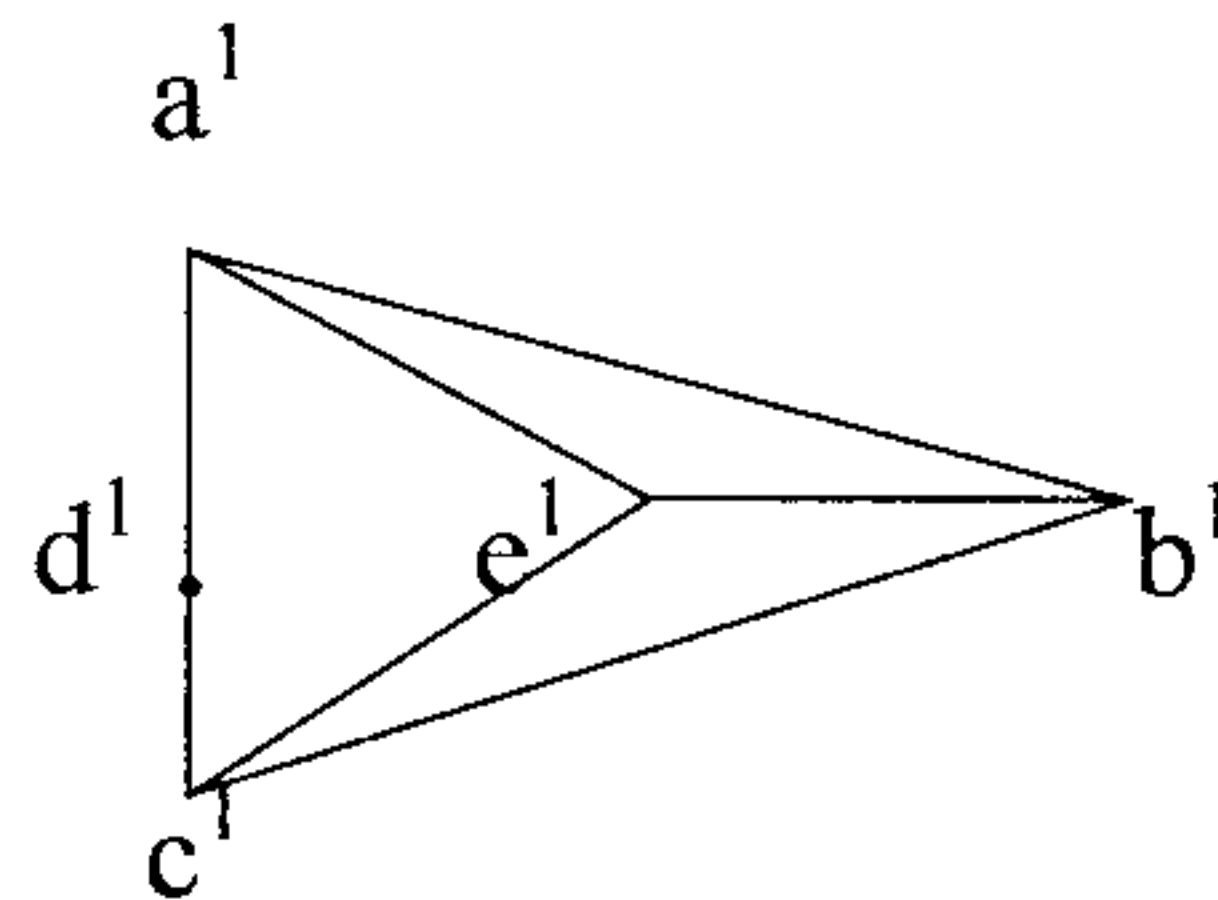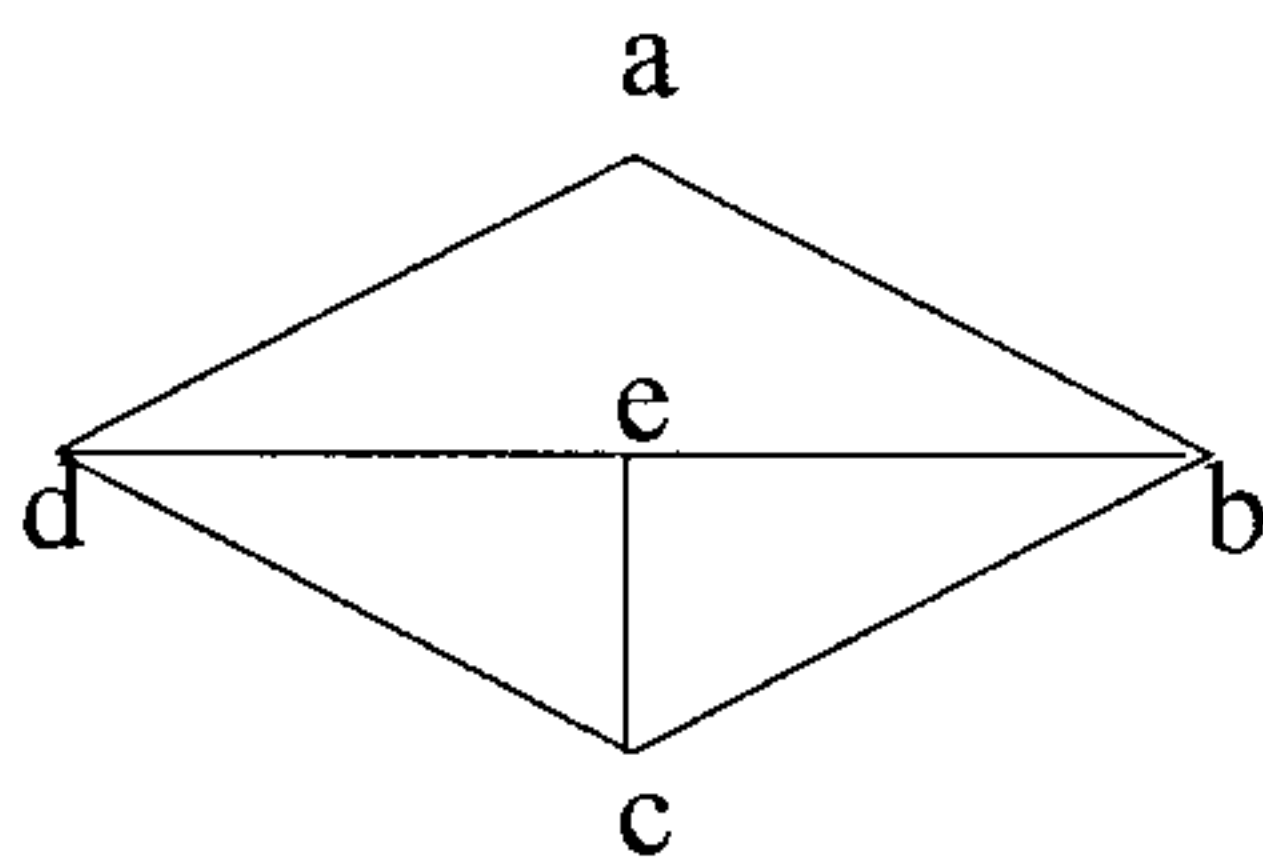
b) Define Hamiltonian graph. Write the basic rules for constructing Hamiltonian paths and cycles.   7 M