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PVP 12

Code: CS3T1

II B.Tech - I Semester – Regular Examinations - January 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) Verify whether the following formula is a tautology or contradiction

   $\sim\big(P \vee (Q \wedge R)\big) \leftrightarrow (P \vee Q) \wedge (P \vee R)$.   7 M

   b) Verify the principle of duality for

   $[\sim(P \wedge Q) \rightarrow \sim P \vee (\sim P \vee Q)] \Leftrightarrow (\sim P \vee Q)$.   7 M

2. a) Obtain the principal conjunctive normal form of

   $(\sim P \rightarrow R) \wedge (Q \leftrightarrow P)$.   7 M

   b) Obtain the principal disjunctive normal form of

   $P \rightarrow \big((P \rightarrow Q) \wedge \sim(\sim Q \vee \sim P)\big)$.   7 M

3. a) Using rules of inference, verify the validity of the conclusion from the premises given below: 7 M

   Premises: $\sim R \rightarrow (S \rightarrow \sim T), \sim R \vee W, \sim P \rightarrow S, \sim W$

   Conclusion: $T \rightarrow P$

b) Verify the validity of the following argument by using the rules of inference 7 M

"Every living thing is a plant or an animal. John's goldfish is alive and it is not a plant. All animals have hearts. Therefore John's goldfish has a heart".

4. a) Find the number of ways of placing 40 similar balls into 12 numbered boxes so that first box contain any number of balls in between 2 and 6 inclusive, second box contain exactly 2 balls, and the other 10 boxes contain any number of balls. 8 M

b) Find P(8, 3)+P(4, 2) 6 M

5. a) Solve the linear recurrence relation by using substitution method.

$a_n = a_{n-1} + 3^n, n \geq 1, a_0 = 1.$ 7 M

b) Solve the linear recurrence relation by using method of characteristic roots.

$a_n - 7a_{n-1} + 12a_{n-2} = 0, n \geq 2, a_0 = 2$ and $a_1 = 5.$ 7 M

6. a) If R is a relation on the set of integers Z defined by 7 M
$R = \{(x, y): x - y \text{ is divisible by a non} - \text{zero integer } m\}$
then prove that R is an equivalence relation?

b) In a lattice, show that $(a * b) \oplus (c * d) \leq (a \oplus c) * (b \oplus d)$ 7 M

7. a) Consider the relation

$R=\{(a,a),(a,b),(a,c),(b,b),(b,d),(c,c),(c,d)\}$.

Draw digraph for the relation R and represent adjacency matrix? 7 M

b) Let $A=\{1,2,3,4\}$ and let

$R=\{(1,1),(1,3),(2,4),(3,1),(3,3),(4,3)\}$.

Compute the transitive closure of R. 7 M

8. a) If G is a connected plane graph, then $|V| - |E| + |R|=2$.

Where V is number of vertices, E is number of edges, and R is number of regions. 7 M

b) Define Hamiltonian and Eulerian graphs? Also give an example of a graph which is Eulerian but not Hamiltonian.

7 M