Code No: A109210501 **R09** **Set No. 2**

II B.Tech I Semester Examinations,November 2010
MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE
Common to Information Technology, Computer Science And Engineering
Time: 3 hours **Max Marks: 75**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Prove or disprove the validity of the following arguments using the rules of inference.
All men are fallible
All kings are men
Therefore, all kings are fallible

   (b) Show that $(\exists x)\,(p\,(x)\,\Lambda Q\,(x)) \Rightarrow (\exists x)\,(p\,(x)\,\Lambda \exists\,(x)\,Q\,(x))$. [15]

2. (a) Draw a planar representation of the following graph. Figure 1.

   (b) What do you mean by a spanning tree? Explain DFS method for finding a spanning tree for the graph. [15]

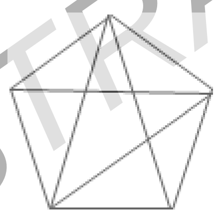

Figure 1:

3. (a) Show that the following statements are logically equivalent without using truth table.
$\neg\,(PV\,(\neg P\Lambda Q)) \Leftrightarrow \neg P\Lambda\neg Q$

   (b) Show that the following statements is a tautology.
$(\neg P\Lambda\,(P \to Q)) \to \neg Q$ [15]

4. Find the general solution for the recurrence relation $a_n - a_{n-1} = 4(n + n^3)$, where $n \geq 1$, and $a_0 = 5$ [15]

5. (a) Using the binomial theorem to prove that
$3^n = \sum_{r=0}^{n} c(n, r)\,2^r.$

   (b) If x>2, y>0, z>0 then find the number of solutions of x+y+z+w=21. [15]

6. (a) Write an algorithm to determine if a connected graph is Eulerian,using its adjacency list representation.

   (b) Write an algorithm to determine if a connected graph contains an Eulerian path, using its adjacency matrix. [15]

7. Prove the theorem: Every equivalence relation R on a set generates a unique partition of the set. The blocks of this partition correspond to the R equivalence classes. [15]

8. If (G, *) and (H, Δ) are two groups and f: G$\rightarrow$H is homorphism, then prove that the kernel of 'f' is a normal subgroup. [15]

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Code No: A109210501 **R09** **Set No. 4**

II B.Tech I Semester Examinations,November 2010
MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE
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Time: 3 hours **Max Marks: 75**
Answer any FIVE Questions
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1. (a) State the binomial theorem.
   (b) Show that the number of r-permutations of a set of n (distinct) elements is given by P(n,r) = n!/(n-r)! [5+10]
2. (a) Prove that H = {0,2,4,} forms a sub group of <Z_6, $+_6$>.
   (b) Consider the group G = {1,2,4,7,8,11,13,14} under multiplication modulo 15. Construct the multiplication table of G and verify whether G is cycle or not. [7+8]
3. (a) Construct the truth table for the following statement
   $(\neg P \leftrightarrow \neg Q) \leftrightarrow (Q \leftrightarrow R)$
   (b) Show that the following statements are logically equivalent without using truth table.
   $(P \rightarrow Q) \Lambda (P \rightarrow R) \Leftrightarrow P \rightarrow (Q \Lambda R)$ [15]
4. (a) Prove that if G is a plane graph, then the sum of the degrees of the regions determined by G is $2|E|$, where $|E|$ is the number of edges of G.
   (b) Determine if bipartite graph $K_{2,2}$ is planar or not. [15]
5. (a) Give an example to show that (x)(A(x) Λ B(x)) need not be a conclusion form (∃ x)A(x) and (∃ x)B(x).
   (b) FShow that (∃ x) M(x) follows logically from the premises
   (x) H(x) → M(x) and (∃ x) H(x). [15]
6. (a) A function f(Z×Z) → Z is defined by f(x,y) = 4x = 5y. Prove that f is not one-to-one, but onto
   (b) If A,B,C are three sets such that A ⊆ B. Show that $(A \times C) \subseteq (B \times C)$
   (c) If A = {1,2,3}, B = {4,5}. Find
      i. A×B
      ii. B×A [15]
7. (a) State and prove Five Colour theorem.
   (b) Find a subgraph of G which is isomorphic to K_{33}. [15]
8. (a) Solve the recurrence relation $u_{n+2}+4u_{n+1}+3u_n=5(-2)^n$, $u_0=1$, $u_1=0$ using generating function.

(b) Solve the recurrence relation u_{n+2}-u_{n+1}-12u_n=10, $u_1=\frac{1}{3}$, u_0=0. [15]

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Code No: A109210501 **R09** **Set No. 1**

II B.Tech I Semester Examinations,November 2010
MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE
Common to Information Technology, Computer Science And Engineering
Time: 3 hours **Max Marks: 75**
Answer any FIVE Questions
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1. (a) Determine the truth value of each of the following statements
   i. 6 + 2 = 7 and 4 + 4 = 8.
   ii. four is even.
   iii. 4 + 3 = 7 and 6 + 2 = 8.

   (b) Write each of the following statements in symbolic form
   i. Anil & Sunil are rich.
   ii. Neither Ramu nor Raju is poor.
   iii. It is not true that Ravi & Raju are both rich.

   (c) Write a short note on normal forms [15]

2. (a) Give an example of a connected graph G where removing any edge of G results in a disconnected graph.
   (b) Give an example for a bipartite graph with examples.
   (c) Discuss graph coloring problem with required examples. [15]

3. (a) Find the number of positive integers less than are equal to 2076 and divisible by 3 or 4.
   (b) Find the coefficient of x^4y^7 in the expansion of (x-y)^{11}. [15]

4. (a) Find the generating function of n^2-2.
   (b) Solve $a_n = a_{n-1} + n$, where $a_0 = 2$ by substitution [15]

5. (a) Let f(x): x^2-3x+2. Find
   i. f(x^2)
   ii. f(x+3)

   (b) Prove that $A - (B \cap C) = (A - B) \cup (A - C)$
   (c) Define equivalence relation [15]

6. (a) Show that if a plane graph is self-dual, then $|E| = 2|V| - 2$
   (b) Give the adjacency matrix of the digraph G = ({a,b,c,d},R), where R = {(a,b),(b,c),(d,c),(d,a)}. [15]

7. In a symmetric group S3 find those elements of a and b, such that
   (a) a^2 = e

(b) $a^3 = e$

(c) $(a+b)^2 \neq a^2 * b^2$. [15]

8. (a) Is the following conclusion validly derivable from the premises given? Verify. If $(x)(P(x) \rightarrow Q(x))$, $(exists\ y)P(y)$ then $(exists\ z)Q(z)$.

   (b) Prove that $(x)(H(x) \rightarrow A(x)) \Rightarrow (x)(\ (\exists\ y)(H(y)\ \Lambda\ N(x, y)) \rightarrow (\exists\ y)(A(\ y)\ \Lambda\ N(x, y))$. [15]

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Code No: A109210501 **R09** **Set No. 3**

II B.Tech I Semester Examinations,November 2010
MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE
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Time: 3 hours **Max Marks: 75**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Let f:Z → N be defined by
   F(x) = { 2x-1 if x>0
   { -2x if x≤0

   (b) Let A = {0,1,2,3,4}. Show that the relation R = {(0,0), (0,4), (1,1), (1,3), (2,2), (3,1), (3,3), (4,0), (4,4,)} is an equivalence relation. Find the distinct equivalence classes of R. [15]

2. (a) Using Krushall's algorithm, find a minimal spanning tree for the graph given in the following table.

Weight	7	10	10	11	12	12	13	13	13	15
Edges	(a, b)	(a, d)	(b, d)	(b, e)	(a, e)	(c, e)	(b, c)	(c, d)	(d, e)	(a, c)

   (b) Prove that a connected plane graph with 7 vertices and degree(V) = 4 for each vertex V of G must have 8 regions of degree 3 and one region of degree 4. [15]

3. Obtain the PCNF of the following formula $(\neg P \rightarrow R) \Lambda (Q \leftrightarrow P)$

   (a) Using Truth Table.

   (b) Without using Truth Table. [15]

4. (a) Show that the set G = {1,2,3,4,5} is not a group under addition and multiplication modulo 6 (i.e. X_6 and $+_6$).

   (b) If G is the set of all matrices of the type $\begin{pmatrix} a & 0 \\ 0 & a^{-1} \end{pmatrix}$ where a ≠ e. Prove that G is an abelian group under matrix multiplication. [15]

5. (a) Applying the multiplication principle show that a set S with n elements has 2^n subsets.

   (b) One type of automobile license plate number in Masachusetts consists of one letter and five digits. Compute the number of such license plate numbers possible. [15]

6. (a) Prove or disprove the conclusion given below from the following axioms. If Socrates is a man, then Socrates is mortal. Socrates is a man. Therefore, Socrates is mortal.

   (b) Using proof by contradiction show that $\sqrt{2}$ is not a rational number. [15]

7. (a) Find the generating function of $(n\text{-}1)^2$.

   (b) Solve the difference equation u_n-$2u_{n-1}$=$5.(2)^n$ using generating function. [15]

8. (a) Find whether the following (figure 2) is Hamiltonian or Eulerian. If so find the cycle otherwise write the reason.

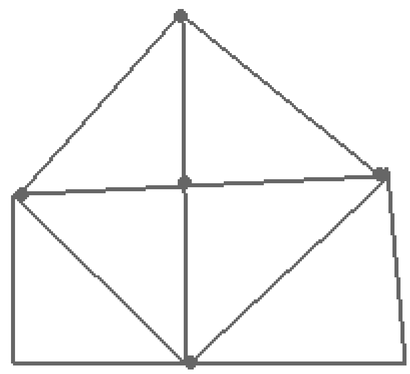

Figure 2:

(b) Find the chromatic number of the following graph (figure 3). [15]

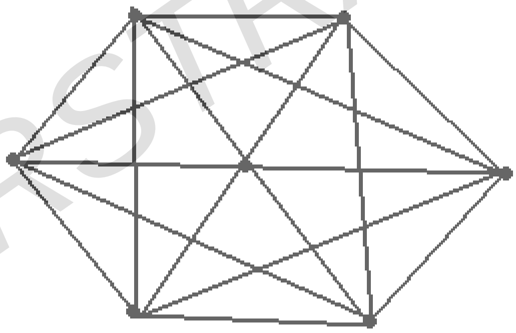

Figure 3:

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