Code No: R21053 **R10** SET - 1

II B. Tech I Semester Supplementary Examinations, September - 2014

MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE AND ENGINEERING

(Com. to CSE, IT, ECC)

Time: 3 hours Max. Marks: 75

Answer any **FIVE** Questions

All Questions carry **Equal** Marks

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1. a) Obtain the principal disjunctive and conjunctive normal forms of the formula
   $(\sim P \vee \sim Q) \rightarrow (P \leftrightarrow \sim Q)$

   b) Prove or disprove the validity of the following arguments
   All dogs are carnivorous.
   Some animals are dogs.
   Therefore, some animals are carnivorous.

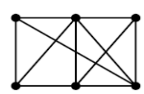
2. a) Using mathematical induction, prove that the following statement is true for all positive integers n.
   $$1^2 + 2^2 + 3^2 + \ldots + n^2 = \frac{n(n+1)(2n+1)}{6} \text{ for } n \geq 1$$

   b) Find the greatest common divisors of the following pairs of integers 1317 and 56

3. a) Let X={1,2,3,4} if R={(x,y)|(x-y) is integer non zero multiple of 2} and S={(x,y)|(x-y) is integer non zero multiple of 3} find R U S and $R \cap S$.

   b) Show that the inclusion relation is a partial ordering on the power of set S.

4. a) Show that this graph is planar by drawing it in the plane without any edges crossing. Verify Euler's formula for this graph.

   b) Draw the binary tree whose level order indices are { 1,2,4,5,8,10,11,20 }

5. a) Is there a non-simple graph with degree sequence (1,1,3,3,3,4,6,7)

   b) What is the chromatic number of the following?
   i) C_n ii) K_n iii) $K_{m,n}$ iv) tree with n vertices

6. a) If (G, *) is an abelian group, show that $a * b^2 = a^2 * b^2$.

   b) Prove that every distributive lattice is modular.

7. a) In how many ways can 14 people be partitioned into 6 teams where in some order 2 teams have 3 members each, 4 teams have 2 members each?

   b) How many ways are there to fill a box with a dozen doughnuts chosen from 8 different varieties of doughnuts?

8. a) Solve $na_n + (n-1)a_{n-1} = 2^n$ where $a_0=1$

   b) Solve the recurrence relation $a_n - 7a_{n-1} + 10a_{n-2} = 0$ for $n \geq 2$ using generating functions.
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Code No: R21053 **R10** SET - 2

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MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE AND ENGINEERING
(Com. to CSE, IT, ECC)

Time: 3 hours Max. Marks: 75

Answer any **FIVE** Questions
All Questions carry **Equal** Marks
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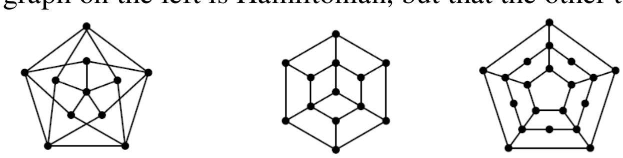
1. a) Obtain the principal disjunctive and conjunctive normal forms of the formula
   $Q \wedge (P \vee \sim Q)$
   b) Prove or disprove the validity of the following arguments
   Some dogs are animals.
   Some cats are animals.
   Therefore, some dogs are cats.

2. a) Using mathematical induction, prove that the following statement is true for all positive integers n.
   $$1^2 + 3^2 + 5^2 + \ldots + (2n-1)^2 = \frac{n\,(2n-1)\,(2n+1)}{3} \text{ for } n \geq 1$$
   b) Find the greatest common divisors of the following pairs of integers 510 and 374

3. a) Show that the inclusion relation is a partial ordering on the power of set S.
   b) Let X={1,2,3,4} if R={(x,y)|(x-y) is integer non zero multiple of 2} and S={(x,y)|(x-y) is integer non zero multiple of 3} find R U S and R ∩ S.

4. a) Draw the binary tree for the sequence of numbers {2,1,5,6,8,9,7,3,4}
   b) Show that the graph on the left is Hamiltonian, but that the other two are not.



5. a) Is a complete graph K_n plannar iff $n \leq 4$.
   b) Explain Breadth first search algorithm with suitable example.

6. a) Show that (Z, +, x) is an integral domain where Z is the set of all integers.
   b) Let (L,≤) be a lattice for any a,b ϵ L . Prove that $a \leq b \Leftrightarrow a*b=a \Leftrightarrow a + b=b$

7. a) In how many ways can 14 people be partitioned into 6 teams where two teams have 3 each and 4 teams have 2 each?
   b) How many ways can 20 similar books be placed on 5 different shelves?

8. a) Solve $a_n = (a_{n-1})^2(a_{n-2})^3$ where $a_0=4$ and $a_1=4$
   b) Solve the recurrence relation $a_n - 6a_{n-1} + 12a_{n-2} - 8a_{n-3}=0$ for $n \geq 3$ using generating functions.
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Code No: R21053 **R10** SET - 3

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MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE AND ENGINEERING

(Com. to CSE, IT, ECC)

Time: 3 hours Max. Marks: 75

Answer any **FIVE** Questions

All Questions carry **Equal** Marks

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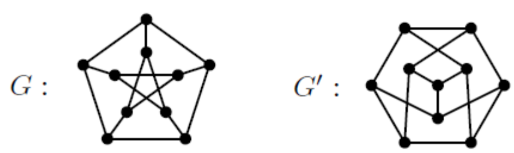
1. a) Obtain the principal disjunctive and conjunctive normal forms of the formula
   $P \rightarrow (P \wedge (Q \rightarrow P))$
   b) Prove or disprove the validity of the following arguments
   All integers are rational numbers.
   Some integers are powers of 2.
   Therefore, some rational numbers are powers of 2.

2. a) Using mathematical induction, prove that the following statement is true for all positive integers n.
   $1^3 + 3^3 + 5^3 + \ldots + (2n-1)^3 = n^2(2n^2-1)$ for $n \geq 1$
   b) Find the greatest common divisors of the following pairs of integers 144 and 118

3. a) Prove that the mapping $f:N \rightarrow N$ defined by $f(n)=n^2+n+1$ is one-one but not onto
   b) Let A be a set with n elements and P(A) is its power set. Show that cordinality of P(A) is 2^n

4. a) What are the rules for constructing Hamiltonian path and Hamiltonian cycle.
   b) Is a complete graph K_n plannar iff $n \leq 4$.

5. a) By suitably lettering the vertices, prove that the following two graphs are isomorphic:



   b) Draw the binary tree for the sequence of numbers {2,1,5,6,8,9,7,3,4}

6. a) Show that N, $\leq$ is a partially ordered set where N is set of all positive integers and $\leq$ is defined by $m \leq n$ if $n - m$ is a non-negative integer.
   b) Let (L,$\leq$) be a lattice for any a,b ϵ L . Prove that $a \leq b \Leftrightarrow a*b=a \Leftrightarrow a + b=b$

7. a) In how many ways can 14 people be partitioned into 6 teams when the first and second teams have 3 members each and the third, fourth, fifth, and sixth teams have 2 members each ?
   b) How many different outcomes are possible from tossing 10 similar dice?

8. a) Solve $u_n=3u_{n-1}$, $n \geq 1$ using generating function.
   b) Solve the recurrence relation $a_n - 9a_{n-1} + 26a_{n-2} - 24a_{n-3}=0$ for $n \geq 3$ using generating functions.
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Code No: R21053 **R10** SET - 4

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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) Obtain the principal disjunctive and conjunctive normal forms of the formula
$(Q \rightarrow P) \wedge (\sim P \wedge Q)$
b) Prove or disprove the validity of the following arguments
Some rational numbers are powers of 3.
All integers are rational numbers.
Therefore, some integers are powers of 3.

2. a) Using mathematical induction, prove that the following statement is true for all positive integers n.
$1^2 - 2^2 + 3^2 - 4^2 + \ldots + (-1)^{n-1} n^2 = \dfrac{n(n+1)(2n+1)}{6}$ for $n \geq 1$
b) Find the greatest common divisors of the following pairs of integers 81 and 36

3. a) Prove that $A-(A-B)=A \cap B$ for any two sets A and B.
b) Let A be a set with n elements and P(A) is its power set. Show that cordinality of P(A) is 2^n

4. a) Explain the Kruskal's algorithm with an example.
b) Draw the binary tree whose level order indices are { 1,2,4,5,8,10,11,20 }

5. a) Perform a breadth first search, and a depth first search on the Petersen graph.
b) Is there a non-simple graph with degree sequence (1,1,3,3,3,4,6,7)

6. a) If S_{42} is the set all divisors of 42 and D is the relation "divisor of" on S_{42}, prove that { S_{42}, D} is a complemented Lattice.
b) Determine whether * defined by $a*b=(a-b)/a^n$ on a set N is binary operation.

7. a) In how many ways can 14 people be partitioned into 6 teams where the first team has 3 members, second team has 2 members ,the third team has 3 members, and the fourth, fifth, and sixth teams each have 2 members ?
b) How many different outcomes are possible by tossing 10 similar coins?

8. a) Write a generating function of a_r, where a_r is the number of integers between 0 and 99 whose sum of digits is r.
b) Solve the recurrence relation $a_n - 8a_{n-1} + 21a_{n-2} - 18a_{n-3}=0$ for $n \geq 3$ using generating functions.
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