II B. Tech I Semester Supplementary Examinations, June - 2015 MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE AND ENGINEERING

(Com. to CSE, IT, ECC) Max. Marks: 70

Note: 1. Question Paper consists of two parts (Part-A and Part-B)

2. Answer **ALL** the question in **Part-A**

3. Answer any THREE Questions from Part-B

PART-A

- 1. a) What is a Well Formed Formula? What are rules of the Well Formed Formulas? Explain
 - b) Explain in brief about Greatest common divisor with an example?
 - c) Draw the Hasse diagram for the poset $(P(S), \supseteq)$, where $S = \{1,2,3,4\}$
 - d) Prove that if G is a non trivial tree then G contains at least 2 vertices of degree 1?
 - e) In how many ways can we chose a black square and white square on an 8 X 8 chessboard?
 - f) Explain in brief about Recurrence relation?

(4M+3M+4M+4M+4M+3M)

PART-B

- 2. a) Prove or disprove the validity of the following arguments using the rules of inference.
 - i) All men are fallible ii) All kings are men iii) Therefore, all kings are fallible
 - b) Show that the following statements is a tautology.

 $(\sim P \land (P \rightarrow Q)) \rightarrow \sim Q$ (8M+8M)

- 3. a) Explain the theorem of principle of inclusion and exclusion for three variables with an example?
 - b) Explain in brief about Properties of integers?

(8M+8M)

- a) How many relations are there on a set with 'n' elements? If a set A has 'm' elements and a set B has 'n' elements, how many relations are there from A to B? If a set $A = \{1, 2\}$, determine all relations from A to A.
 - b) Draw the Hasse diagram of $(P(S), \le)$, where P(S) is power set of the set $S = \{a,b,c\}$?

(8M + 8M)

- a) 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.?
 - b) How many vertices will the graph contain 6 edges and all vertices of degree 3?
- a) Eight people enter an elevator at the first floor. The elevator discharges a passenger on each successive floor until it empties on The fifth floor. How Many different ways can this happen?
 - b) 15 males and 10 females are members are seated in a round table meeting. How many ways they can seated if all the females seated together? (8M+8M)
- 7. a) Solve the recurrence relation un+2-un+1-12un=10, u1=13, u0=0.
 - b) Solve the recurrence relation un+2+4un+1+3un=5(-2)n,u0=1,u1=0 using gen-erating function. (8M + 8M)

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Time: 3 hours

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3. Answer any THREE Questions from Part-B

PART-A

- 1. a) Find the truth table for the propositional formula $(P \leftrightarrow \sim Q) \leftrightarrow (Q \rightarrow P)$?
 - b) Explain in brief about principle of inclusion with an example?
 - c) Draw the Hasse diagram of $(P(S) \ge)$, where P(S) is power set of the set $S = \{a, b, c\}$?
 - d) Discuss graph coloring problem with required examples. ?
 - e) Find the sum of all 4 digit numbers that can be obtained by using the digits 2, 3, 5 and 7 (without repetition)?
 - f) Find the generating function of n^2-2?

(4M+3M+4M+4M+4M+3M)

PART-B

- 2. a) Construct the truth table for the following statement $(\sim P \leftrightarrow \sim Q) \leftrightarrow (Q \leftrightarrow R)$?
 - b) Show that the following statements are logically equivalent without using truth table.

 $(P \rightarrow Q) \land (P \rightarrow R) \leftrightarrow P \rightarrow (Q \land R)$?

(8M + 8M)

SET - 2

- 3. a) Explain in brief about Fermats theorem?
 - b) Explain in brief about Division theorem?

(8M + 8M)

- 4. a) Draw the Hasse diagram for the poset $(P(S),\subseteq)$, where $S=\{1,2,3,4\}$
 - b) Let $X = \{1, 2, 3, 4, 5, 6, 7\}$ and $R = \{(x,y)/x-y \text{ is divisible by } 3\}$ in X. show that R is an Equivalence Relation.? (8M+8M)
- 5. a) State the kruskal's algorithm for Finding Minimal Spanning Tree? Explain it with an Example?
 - b) Describe an algorithm to decide whether a graph is bipartite?

(8M+8M)

- 6. a) Compute the number of 10-digit numbers which contain only the digits 1,2 and 3 with the digit 2 appearing in each number twice?
 - b) Let G be a group of order P, where P is a prime. Find all subgroups of G.? (8M+8M)
- 7. a) Find a particular solution for recurrence relation using the method of determined coefficients an- 7 an-1+12an-2=n.2^n
 - b) Solve an=an-1 + n where a0 = 2 by substitution?

(8M + 8M)

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PART-A

- 1. a) What is the compound statement that is true when exactly two of the three statements P, Q and R are true?
 - b) Explain in brief about principle of exclusion with an example?
 - c) Prove that $A (B \cap C) = (A-B) \cup (A-C)$?
 - d) Define and explain planar graphs with examples?
 - e) Show that the identity element in a group is unique?
 - f) Find the generating function of (n-1)2?

(4M+3M+4M+4M+4M+3M)

PART-B

- 2. 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.

(8M+8M)

SET - 3

- 3. a) Explain in brief about Eulers Theorem with Example?
 - b) Explain in brief about Least common multiple with Example?

(8M+8M)

- 4. a) Let $A = \{1, 2, 3, 4\}$ and $P = \{\{1, 2, 3\}, \{4\}\}$ be a partition of A. Find the equivalence relation determined by P. ?
 - b) If A, B, C are three sets such that $A \subseteq B$. show that $(A \times C) \subseteq (B \times C)$?

(8M + 8M)

- 5. a) Write the rules for constructing Hamiltonian paths and cycles?
 - b) Write the difference between Hamiltonian graphs and Euler graphs?

(8M + 8M)

- 6. a) 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?
 - b) Prove that $H = \{0,2,4,\}$ forms a sub group of < Z6,+6>?

(8M + 8M)

- 7. a) Solve the difference equation un-2un-1 2=(5).2 ?
 - b) Find a particular solution for recurrence relation using the method of determined coefficients an- 5 an-1=3^n? (8M+8M)

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PART-A

- 1. a) Using predicate logic, prove the validity of the following argument "Everyhusband argues with his wife." X' is A husband. Therefore, "X'argues With his wife".?
 - b) Explain in brief about modular arithmetic?
 - c) If $A = \{1,2,3\}$, $B = \{4,5\}$. Find A X B and B X A?
 - d) How many edges does a graph have if it has vertices of degree 4,3,3,2,2?Draw such a graph?
 - e) State the binomial theorem?
 - f) Solve the an -6an-1+8 an-2 = n .4 where a0 = 8 and a 1=22? (4M+3M+4M+4M+4M+3M)

PART-B

- 2. a) Obtain the PCNF of the following formula $(\sim P \rightarrow R) \land (Q \rightarrow P)$
 - i) Using Truth Table. ii) Without using Truth Table.
 - b) What is the negation of the statement "2 is even and -3 is negative?" (8M+8M)
- 3. a) Explain in brief about Euclidean algorithm?
 - b) Explain in brief about testing the prime numbers?

(8M+8M)

- 4. a) A function $f(Z \times Z) \rightarrow Z$ is defined by f(x,y)=4x=5y. Prove that f is not one-to-one, but on to?
 - b) Let f(x): $x^2 3x + 2$. Find $f(x^2)$ and $f(x^2)$?

(8M + 8M)

- 5. a) Prove that isomorphism is an equivalence relation on diagraphs?
 - b) How many equivalence classes are there for loop-free diagraphs with three vertices?

(8M+8M)

- 6. a) 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.?
 - b) Find the number of positive integers less than are equal to 2076 and divisible by 3 or 4?

(8M+8M)

- 7. a) Define recurrence relation? Show that the sequence {an} is a solution of re-currence relation an=-3an-1 +4an-2 if an =1?
 - b) What is solution of the recurrence relation an = an-1+2 an-2 with a0 = 2 and a1 = 7?

(8M+8M)

1 of 1

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