Code No: R1621052 **R16** SET - 1

II B. Tech I Semester Regular Examinations, October/November - 2017
MATHEMATICAL FOUNDATION OF COMPUTER SCIENCE
(Com to CSE & IT)

Time: 3 hours 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 **FOUR** Questions from **Part-B**

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PART –A

1. a) Explain universal quantifier (2M)
b) Explain partition and covering (2M)
c) Explain cyclic group (2M)
d) Explain the principle of inclusion and exclusion (2M)
e) In how many ways can 20 similar books be placed on 5 different shelves? (3M)
f) Explain planar graphs with example? (3M)

PART –B

2. a) Establish the validity of the following argument "All integers are rational numbers. Some integers are powers of 2. Therefore, some rational numbers are powers of 2" (7M)
b) Using the indirect method of proof show that $p \rightarrow q$, $q \rightarrow r$, $\neg (p \wedge r)$, $(p \vee r)$ leads to conclusion' r' (7M)

3. a) Explain representation of partially ordered set with suitable example? (7M)
b) Explain different types of functions with examples? Find inverse of 2x+3/4x-5 (7M)

4. a) Find the gcd of 42823 and 6409 using Euclidean algorithm (7M)
b) Explain properties of integers with suitable examples? (7M)

5. a) Find the number of integer solutions of $x_1 + x_2 + x_3 + x_4 + x_5 = 30$ where $x_1 \geq 2$, $x_2 \geq 3$, $x_3 \geq 4$, $x_4 \geq 2$, $x_5 \geq 0$. (7M)
b) Find the number of ways of giving 15 identical gift boxes to 6 persons A, B, C, D, E, F in such a way that the total number of boxes given to A nad B does not exceed 6. (7M)

6. a) Solve the recurrence relation $a_n - 6 a_{n-1} + 9 a_{n-2} = 0$ for n >= 2 Given that $a_0 = 5$, $a_1 = 12$. (7M)
b) Solve the recurrence relation $a_{n+3} = 3a_{n+2} + 4 a_{n+1} - 12a_n$, for n >= 0, Given that $a_0 = 0$, $a_1 = -11$, $a_2 = -15$. (7M)

7. a) Show that in a connected planar graph G with n vertices and m edges has regions r = m-n+2 in every one of its diagram? (7M)
b) Explain isomorphism of two graphs with suitable example (7M)

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PART –A

1. a) Explain existential quantifier (2M)
   b) Explain permutation of functions (2M)
   c) State Fermat's theorem (2M)
   d) Explain binomial theorem with example (3M)
   e) Explain general solution and particular solution of recurrence relation? (3M)
   f) Explain multi graph with example (2M)

PART –B

2. a) Show that $((P \vee Q) \wedge 7(7P \wedge (7Q \vee 7R))) \vee (7P \wedge 7Q) \vee (7P \wedge 7R)$ is a tautology (7M)
   b) Explain pdnf, pcnf with suitable examples (7M)

3. a) In a distributive lattice, if $a \wedge b = a \wedge c$ and $a \vee b = a \vee c$, prove that $b = c$ (7M)
   b) Draw the Hasse's diagrams representing the positive divisors of 36 and 120 (7M)

4. a) State and prove lagrange's theorem (7M)
   b) Explain ring, integral domain and field with suitable examples? (7M)

5. a) Find the number of three digit even numbers with no repeated digits? (7M)
   b) Find the least number of ways of choosing three different numbers from 1 to 10 so that all choices have the same sum? (7M)

6. a) Find the generating functions of the following sequence (7M)
   (i) 0,1,-2,3,-4,……
   (ii) 0,2,6,12,20,30,42,……..
   b) Solve the recurrence relation $2a_n - 3a_{n-1} = 0$ for $n >= 1$ Given that $a_4 = 81$. (7M)

7. a) Define Eulerian circuit and Hamiltonian circuit, give an example of graph that has neither an Eulerian circuit nor Hamiltonian circuit. (7M)
   b) Explain kruskal's algorithm to find minimal spanning tree of the graph with suitable example? (7M)
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PART –A

1. a) Explain bounded variable with example (2M)
   b) Explain transitive closure with example (2M)
   c) Explain lattice with example (2M)
   d) In how many ways can three different coins be placed in two different purses? (3M)
   e) Explain recurrence relation with example (3M)
   f) Explain Hamiltonian graph with example (2M)

PART –B

2. a) Show that from (a) $(\exists x)\ (F(x) \land S(x)) \rightarrow (y)\ (M(y) \rightarrow W(y))$ (b)$(\exists y)\ (M(y) \land \neg W(y))$ The conclusion $(x)\ (F(x) \rightarrow \neg S(x))$ follows (7M)
   b) Write all implications and equivalences of statement calculus (7M)

3. a) By means of example show that $A \times B \neq B \times A$ and $(A \times B) \times C \neq A \times (B \times C)$ (7M)
   b) Let f: R→R and g: R→R, where R is the set of real numbers. Find fog and gof where $f(x) = x^2 - 2$ and $g(x) = x+4$ .State where these functions are injective, surjective, bijective? (7M)

4. a) Explain Euclidian algorithm to find The Greatest Common Divisor of two numbers with suitable example? (7M)
   b) (i) Prove that the inverse of the product of two elements of a group is the product of their inverses in reverse order? (ii) Prove that if "a" is any element of group G then $(a^{-1})^{-1} = a$ (7M)

5. a) In a sample of 200 logic chips, 46 have a defect D1, 52 have a defect D2, 60 have a defect D3, 14 have defects D1 and D2, 16 have defects D1 and D3, 20 have defects D2 and D3, and 3 have all the three defects. Find the number of chips having (i) at least one defect, (ii) no defect. (7M)
   b) Prove the identity $C(n+1, r) = C(n, r-1) + C(n, r)$ (7M)

6. a) Solve the recurrence relation $a_n = 10a_{n-1} + 29a_{n-2}$ for $n >= 3$ Given that $a_1 = 10$, $a_2 = 100$. (7M)
   b) Solve the recurrence relation $2a_{n+3} = a_{n+2} + 2a_{n+1} - a_n$, for $n >= 0$, Given that $a_0 = 0$, $a_1 = 1$, $a_2 = 2$. (7M)
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7. a) Define spanning tree of a graph, and explain DFS algorithm to find spanning tree of a graph with suitable example? (7M)
   b) Explain union, intersection and symmetric difference of the graphs with suitable example? (7M)

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PART –A

1. a) Explain contra positive with example (2M)
   b) Explain properties of binary relations (3M)
   c) Define compatibility of relation and give suitable example (3M)
   d) Explain sum rule with example (2M)
   e) Define generating function and give suitable example (2M)
   f) Explain adjacency matrix of the graph? (2M)

PART –B

2. a) Explain pdnf ? find pdnf of P ->((P->Q) Λ 7(7Q V 7P)) (7M)
   b) Verify the validity of the following argument "every living thing is a planet or an animal. Joe's gold fish is alive and it is not a planet. All animals have hearts. Therefore Joe's gold fish has a heart. (7M)

3. a) If A,B and C are any three sets then prove that (i) $A\cup (B- A) = A\cup B$ (ii) $A – (B \cup C) = (A- B) \cap (A- C)$ (7M)
   b) Let X = { 1,2,3,4,5,6,7 } and R = { (x, y) / x – y is divisible by 3}. Show that R is an equivalence relation. Draw the graph of R. (7M)

4. a) Show that every cyclic group is abelian group, but the converse is not true. (7M)
   b) Show that intersection of any two subgroups of a group G is also a sub group of G. (7M)

5. a) A women has 20 close relatives and she wishes to invite 7 of them to dinner.Iin how many ways she can invite them in the following situations: (7M)
      (i) Two particular persons will not attend separately.
      (ii) Two particular persons will not attend together.
   b) State and prove multinomial theorem? Determine the coefficient of $x^3y^3z^2$ in the expansion of $(2x – 3y + 5z)^8$ (7M)

6. a) Solve the recurrence relation $a_n + 7a_{n-1} +8 a_{n-2} =0$ for n >= 2 Given that $a_0 =2$, $a_1 =-7$. (7M)
   b) Solve the recurrence relation $a_n + a_{n-1} - 8 a_{n-2} - 12 a_{n-3} =0$ for n >= 3, Given that $a_0 =1$, $a_1 =5$, $a_2 =1$. (7M)

7. a) Show that the complete graph K_5 and complete bipartite graph $K_{3,3}$ are not planar? (7M)
   b) Prove that a connected graph is a tree if and only if it is minimally connected. (7M)
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