

Code No: R21053

R10

SET - 1

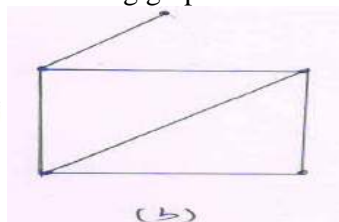
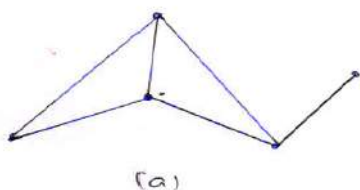
II B. Tech I Semester Supplementary Examinations, June - 2015
MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE AND ENGINEERING
(Com. to CSE, IT, ECC)

Time: 3 hours

Max. Marks: 75

Answer any **FIVE** Questions
All Questions carry **Equal** Marks

- 1 a) Write down the following statements in symbolic form using quantifiers. 7
 (i) Every real number has an additive inverse.
 (ii) The set of real numbers has a multiplicative identity.
- b) Define conjunctive normal form. Find conjunctive normal form of 8
 $(p \rightarrow (r \rightarrow q)) \leftrightarrow ((p \wedge r) \rightarrow q)$
- 2 a) Explain the basic properties of integers with suitable examples 7
- b) Prove that by principle of mathematical induction 8
 $P(n) = 1.2 + 2.2^2 + 3.2^3 + \dots + n.2^n = (n-1)2^{n+1} + 2$
- 3 a) In a class of 70 students 27 are studying Hindi, 35 are studying English, 12 are 8
 studying both languages. i) How many in the class are studying at least one of the
 languages? ii) How many are studying neither of these languages?
- b) Let D_n denote the positive divisors of 'n' ordered by divisibility. Draw hasse 7
 diagram of D_{30}, D_{72} .
- 4 a) Show that if a bipartite graph is regular, both of its bipartites must have the same 7
 number of vertices.
- b) Define isomorphism. Show that the following graphs are isomorphic or not? 8



- 5 a) Explain Breadth First Search algorithm to find spanning tree of a graph with suitable 7
 example?
- b) Explain kruskal's algorithm and find minimal spanning tree of the graph with 8
 suitable example



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- 6 a) State and prove Lagrange's theorem 8
- b) (i) Show that every cyclic group is abelian? 7
(ii) Show that inverse of any element in a group is unique?
- 7 a) A student visits a sports club every day from Monday to Friday after school hours and plays one of the three games cricket, tennis, football. In how many ways can he play each of the three games at least once during a week (from Monday to Friday) 8
- b) State and prove pigeonhole principle. Explain with example? 7
- 8 a) Solve the following recurrence relation $a_n = 5a_{n-1} + 6a_{n-2}$ with initial conditions $a_0 = a_1 = 3$ and $n \geq 2$ 8
- b) Solve the following recurrence relation $a_n + a_{n-1} - 8a_{n-2} - 12a_{n-3} = 0$ for $n \geq 3$, given that $a_0 = 1$ and $a_1 = 5, a_2 = 1$? 7

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SET - 2

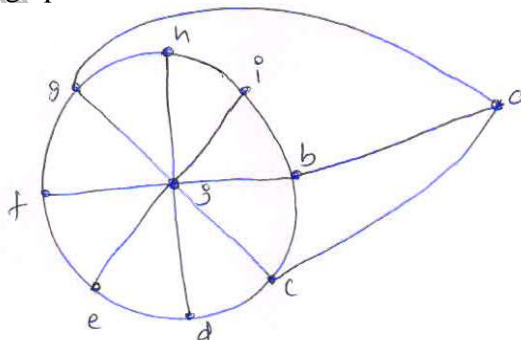
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- 1 a) Explain the converse, inverse and contra positive with suitable examples? 7
- b) Describe disjunctive normal form and find disjunctive normal form of $(P \rightarrow (Q \vee R)) \wedge (\neg Q) \wedge (\neg R) \wedge P$ 8
- 2 a) State and prove fundamental theorem of arithmetic? 7
- b) Prove that by principle of mathematical induction $3^{4n+2} + 5^{2n+1}$ is a multiple of 14 for all positive integral value of n including zero? 8
- 3 a) Among the first 500 positive integers 8
 - (i) Determine the integers which are neither divisible by 5,7,nor 9
 - (ii) Determine the integers which are divisible by 5 but not by 7 and 9.
- b) Show that by using set representation $A \cap (B - C) = (A \cap B) - (A \cap C)$ 7
- 4 a) Show that a connected graph with n vertices has at least n-1 edges? 7
- b) Define Hamiltonian and Eulerian graphs (i) Draw a graph with six vertices which is Hamiltonian but not Eulerian and (ii) Eulerian but not hamiltonian? 8
- 5 a) Explain Depth First Search algorithm to find spanning tree of a graph with suitable example? 8
- b) Explain graph coloring problem. Define chromatic number and find chromatic number of the given graph 7



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SET - 2

- 6 a) Let (L, \leq) be a lattice and $a, b, c \in L$ then the following results hold 8
(i) If $a \leq b$ and $a \leq c$ then $a \leq b \vee c$
(ii) If $a \leq b$ and $a \leq c$ then $a \leq b \wedge c$
b) Prove that the complement of elements in a distributive lattice is unique 7
- 7 a) Find the total number of positive integers that can be formed from the digits 8
1,2,3,4,5, if no digit is repeated in any one integer?
b) ABC is an equilateral triangle whose sides are of length 1CM each .if we select five 7
points inside the triangle ,prove that at least one of these points are such that the
distance between them is less than 1/2 CM.
- 8 a) Solve the following recurrence relation $a_n - 7 a_{n-2} + 6a_{n-3} = 0$ with initial conditions 8
 $a_0=8, a_1=6$ and $a_2=22$?
b) Evaluate the sum $1^2+2^2+3^2+\dots+r^2$ using generating function? 7

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SET - 3

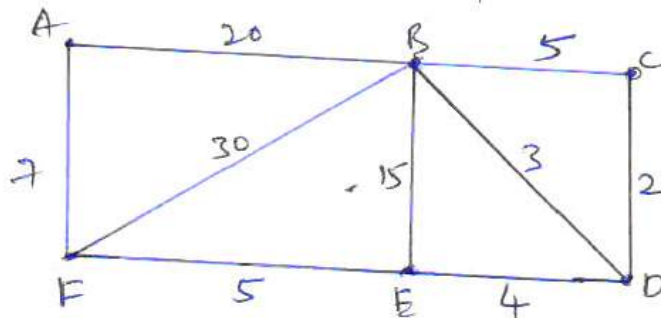
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- 1 a) Explain Principle Conjunctive Normal Form ?obtain Principle conjunctive normal of $(\neg P \rightarrow R) \wedge (Q \leftrightarrow R)$ 8
- b) Show that $((p \vee q) \wedge \neg(\neg p \wedge (\neg q \vee \neg r))) \vee (\neg p \wedge \neg q) \vee (\neg p \wedge \neg r)$ is a tautology? 7
- 2 a) Prove that \sqrt{p} is not a rational number for any prime p? 7
- b) Prove that by principle of mathematical induction $10^n + 3 \cdot 4^{n+2} + 5$ is divisible by 9? 8
- 3 a) In a group of 40 persons 13 are musicians ,8 are poets , 4 are musicians as well as poets ,5 are poets as well as dramatists ,3 are dramatists as well as musicians 1and one person having all the characteristics. how many of them are dramatists? How many of them are only musicians? 8
- b) Show that by using set representation $A \cup (B + C) \neq (A \cup B) - (A \cup C)$ 7
- 4 a) Suppose G1 and G2 are isomorphic .Prove that if G1 is connected then G2 is also connected. 8
- b) Explain matrix representation of graphs with suitable examples? 7
- 5 a) Explain Kruskal's algorithm and find minimal spanning tree of the given graph? 8



- b) Define planar graph. Check whether K_5 and $K_{3,3}$ are planar or non planar graphs? 7



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SET - 3

- 6 a) Prove that the complement of an element 'a' in bounded distributive lattice ,if it exists ,is unique? 8
- b) Let $(S,*)$ be a commutative semigroup show that if $(a * a) = a, (b * b) = b$ then $(a * b) * (a * b) = (a * b)$ 7
- 7 a) Find the least number of ways of choosing 3 different numbers from 1 to 10 so that all choices have the same sum? 8
- b) State and prove multinomial theorem 7
- 8 Find the explicit formula for the sequence defined by $c_n = 3c_{n-1} - 2c_{n-2}$ with initial conditions $c_1=5, c_2=3$ by using the following approaches 15
- (i) Characteristic Equation
- (ii) Generating Function

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- 1 a) Describe disjunctive normal form and find disjunctive normal form of $(P \rightarrow (Q \vee R)) \wedge (\neg Q) \wedge (\neg R) \wedge P$ 8
- b) Write down the following statements in symbolic form using quantifiers. 7
(i) every real number has an additive inverse.
(ii) the set of real numbers has a multiplicative identity.
- 2 a) State and prove division theorem? 7
- b) Prove that by principle of mathematical induction $10^{2n-1} + 1$ is divisible by 11 for each natural number ? 8
- 3 a) Let $X = \{1, 2, 3\}$ and f, g, h be functions X to X given by $g = \{ \langle 1, 2 \rangle, \langle 2, 1 \rangle, \langle 3, 3 \rangle \}$, $f = \{ \langle 1, 2 \rangle, \langle 2, 3 \rangle, \langle 3, 1 \rangle \}$, $h = \{ \langle 1, 1 \rangle, \langle 2, 2 \rangle, \langle 3, 3 \rangle \}$ find $f \circ g \circ h$ and $h \circ g \circ f$. 7
- b) Let $A = \{1, 2, 3\}$ define $A \rightarrow A$ such that $f = \{(1, 2), (2, 1), (3, 3)\}$ find f^{-1} , f^2 and f^3 . 8

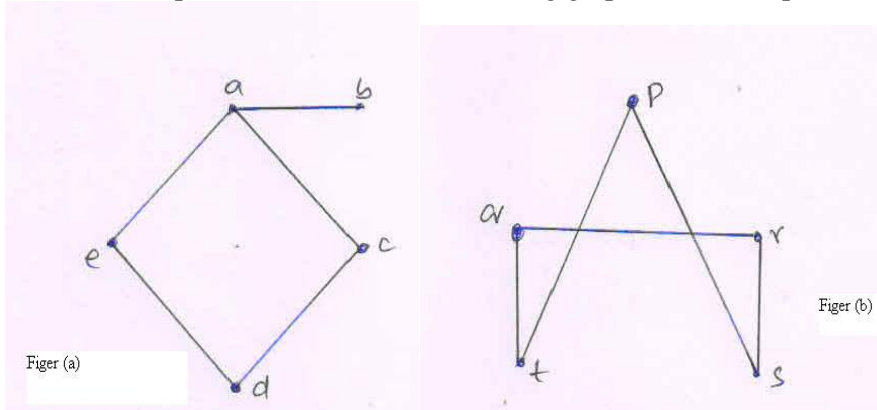


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SET - 4

- 4 a) In a graph G , if the intersection of two paths is a disconnected sub graph, show that the union of the two paths has at least one cycle? 7
- b) Define isomorphism? Show that the following graphs are isomorphic or not? 8



- 5 a) Define Peterson graph. Perform the Breadth First Search on Peterson graph 7
- b) What is the chromatic number of the following graphs 8
- i) C_n ii) K_n iii) $K_{m,n}$ iv) tree with n vertices
- 6 a) State and prove Lagrange's theorem? 7
- b) (i) Show that every cyclic group is abelian? 8
- (ii) Show that inverse of any element in a group is unique?
- 7 a) In how many ways can 7 men and 7 women be seated in a row 8
- (i) if any person may sit next to any other
- (ii) If men and women must occupy alternate seats?
- b) A multiple choice test has 15 questions and 4 choices for each answer. How many ways the 15 questions can be answered so that 3 answers are correct? 7
- 8 a) Solve the following recurrence relation $a_n - 7a_{n-2} + 6a_{n-3} = 0$ with initial conditions $a_0=8, a_1=6$ and $a_2=22$? 8
- b) Solve the following recurrence relation $u_n = 3u_{n-1}, n \geq 1$ using generating function 7