

Code No: R21053

R10**SET - 1**

II B. Tech I Semester, Supplementary Examinations, May – 2013
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) "If there was a ball game, then travelling was difficult. If they arrived on time, then travelling was no difficult. They arrived on time. Therefore, there was no ball game." Show that these statements constitute a valid argument.
 b) Obtain the PCNF of the formula $(\neg P \rightarrow R) \wedge (Q \leftrightarrow P)$
2. a) What is the value of $7^{560} \pmod{5612}$?
 b) What are the value of Euler's Totient Function, $\phi(35)$ and $\phi(240)$?
3. a) Prove that $(A-B) \cup (B-A) = (A \cup B) - (A \cap B)$ for any two sets A and B.
 b) Show that the inclusion relation is a partial ordering on the power of set S.
4. a) Prove that the number of vertices of odd degree in a non directed graph is always even.
 b) Let C_n be a Cycle graph with n vertices. Prove that C_5 is the only cycle graph isomorphic to its complement.
 c) Draw three connected maps of a graph with 6 edges and 3 regions.
5. a) Find whether K_5 is planer graph or not
 b) Explain the Kruskal's algorithm with example.
 c) Find the chromatic number of the following i) C_n ii) K_n iii) $K_{m,n}$ iv) Tree with vertices
6. a) Determine whether usual multiplication on set $A = \{1, -1\}$ is binary operation.
 b) Let (L, \leq) be a lattice for any $a, b, c \in L$. Prove that $a * (a \oplus b) = a$ and $a \oplus (a * b) = a$
7. a) How many ways there to pick a man and a woman who are not married from 30 married couples?
 b) A farmer buys 3 cows, 8 pigs and 12 chickens from a man who has 8 cows, 25 pigs and 100 chickens. How many choices does the farmer have?
 c) Write the formal power series expression for $1/(3+x)$.
8. a) Solve $a_n - 6a_{n-1} + 12a_{n-2} - 8a_{n-3} = 0$ for $n \geq 3$ using generating functions.
 b) Solve $a_n - 7a_{n-1} + 10a_{n-2} = 4^n$



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1. a) Show that $R \wedge (P \vee Q)$ is a valid conclusion from the premises $P \vee Q, Q \rightarrow R, P \rightarrow M$ and $\neg M$.
 b) Obtain the PDNF for $(PAQ) \vee (\neg PAR) \vee (QAR)$
2. a) What are relative prime numbers? Explain with an example.
 b) What are the Euler's Totient Function, $\phi(21)$ and $\phi(240)$?
3. a) Let A be a set with n elements and $P(A)$ is its power set. Show that cardinality of $P(A)$ is 2^n
 b) Prove that the mapping $f: \mathbb{N} \rightarrow \mathbb{N}$ defined by $f(n) = n^2 + n + 1$ is one-one but not onto
4. a) Prove that in any non directed graph there is an even number of vertices of odd degree.
 b) Prove that $|E| = 2|V| - 2$ if Graph is self dual.
 c) Draw three connected maps of a graph with 4 vertices and 5 regions
5. a) Find whether $K_{3,3}$ is planar or not
 b) Explain the Kruskal's algorithm with example.
6. a) Determine whether $*$ defined by $a * b = (a - b) / a^n$ on a set N is binary operation.
 b) Let (L, \leq) be a lattice for any $a, b, c \in L$. Prove that $b \leq c \Rightarrow a * b \leq a * c \Rightarrow a \oplus b \leq a \oplus c$
7. a) How many ways can one right and one left shoe be selected from 10 pairs of shoes without obtaining a pair.
 b) How many ways can 5 days be chosen from each of the 12 months of an ordinary year of 365 days.
 c) Write the formal power series expression for $1/(3+x)^2$
8. a) Solve $a_n + 7a_{n-1} + 8a_{n-2} = 0$ for $n \geq 2$, $a_0 = 1$, $a_1 = -2$ using generating functions.
 b) Solve $a_n - 4a_{n-1} + 4a_{n-2} = 2^n$



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R10**SET - 3**

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1. a) Symbolize the expressions
 - i) All the world loves a lover.
 - ii) All men are giants
 b) Show that SVR is tautologically implied by $(PVQ) \wedge (P \rightarrow R) \wedge (Q \rightarrow S)$.
2. a) Write an algorithm to test whether the given number is prime or not?
 b) What is the value of $7^{560} \pmod{561}$?
3. a) Prove that $A - (A - B) = A \cap B$ for any two sets A and B .
 b) Let $X = \{1, 2, 3, 4\}$ if $R = \{(x, y) | (x - y) \text{ is integer non zero multiple of } 2\}$ and $S = \{(x, y) | (x - y) \text{ is integer non zero multiple of } 3\}$ find $R \cup S$ and $R \cap S$
4. a) What is the largest possible number of vertices in a graph with 35 edges and all vertices of degree at least 3.
 b) Give an example of graph of order 6 and size 6 with degree sequence $(2, 2, 2, 2, 2, 2)$
 c) Draw the graph of $K_{2,5}$
5. a) Suppose that the tree has N vertices of degree 1, 2 vertices of degree 2, 4 vertices of degree 3 and 3 vertices of degree 4. Find N .
 b) Explain Breadth First Search Algorithm with suitable example.
6. a) Determine whether the binary $*$ defined as commutative and whether it is associative on the set Z where $a * b = a - b$
 b) Show that any group G is abelian if and only if $(ab)^2 = a^2 b^2, \forall a, b \in G$.
7. a) In how many ways can 7 women and 3 men be arranged in a row if the men must always stand next to each other.
 b) How many 5 cards consist of only of hearts?
 c) Write the formal power series expression for $1/(3+x)^3$
8. a) Solve $a_n - 9a_{n-1} + 26a_{n-2} - 24a_{n-3} = 0$ for $n \geq 3$ by generating functions.
 b) Solve $a_n - 4a_{n-1} + 4a_{n-2} = 4^n$

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1. a) Express the value of $P \uparrow Q$ in terms of only $\{\downarrow\}$
 b) Show that $(\forall x)(P(x) \vee Q(x)) \Rightarrow (\forall x)P(x) \vee (\exists x)Q(x)$
2. a) What is the value of $17^{22} \pmod{21}$?
 b) State and explain the Fermat's and Euler's theorems
3. a) Prove that $A = (A \cap B) \cup (A - B)$ for any two sets A and B
 b) Let n be a positive integer greater than 1. Show that the relation $R = \{(a, b) | a \equiv b \pmod{n}\}$ is an equivalence relation on the set of integers.
4. a) Suppose that G is a non directed graph with 12 edges. Suppose that G has 6 vertices of degree 3 and the rest have degree less than 3. Determine the minimum number of vertices G can have.
 b) Can a simple graph with 7 vertices be isomorphic to its complement?
 c) Prove that any 2 simple connected graphs with n vertices all of degree 2 are isomorphic.
5. a) Explain DFS algorithm with an example.
 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) What are the identity and inverse elements under * defined by $a * b = ab/2 \forall a, b \in \mathbb{R}$
 b) Prove that every distributive lattice is modular.
7. a) In how many ways can the letters of the English alphabet be arranged so that there are exactly 5 letters between A and B.
 b) How many ways are there to distribute 10 different books among 15 people if no person is to receive more than one book.
 c) Write the formal power series expression for $1/(3+x)^4$
8. a) Solve $a_n - 8a_{n-1} + 21a_{n-2} - 18a_{n-3} = 0$ for $n \geq 3$ using generating functions.
 b) Solve $a_n - 7a_{n-1} + 10a_{n-2} = 2^n$

