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## P4593

# S.E. (Computer \& IT) <br> DISCRETE STRUCTURS <br> (2008 Pattern) (Semester - I) 

## Time : 3 Hours]

[Max. Marks :100

## Instructions to the candidates:

1) Section I : Attempt Q. No. 1 or Q. No. 2, Q. No. 3 or Q. No. 4, Q. No. 5 or Q. No. 6.
2) Section II : Attempt Q. No. 7 or Q. No. 8 Q. No. 9 or Q. No. $10, Q$. No. 11 or Q. No.12.
3) Answers to the two Sections should be written in separate answer books.
4) Neat diagrams must be drawn wherever necessary.
5) Assume suitable data, if necessary.

## SECTION - I

Q1) a) Write the truth table for the following statements :
i) $(\sim \mathrm{p} \vee \mathrm{q})->\mathrm{q}$
ii) $\sim(\mathrm{p} \wedge \mathrm{q}) \vee(\mathrm{p} \times \mathrm{q})$
b) Define disjuctive and conjunctive Normal forms with examples and applications of Discrete Structures.

OR

Q2) a) Among the integrs 1 to 1000 :
i) How many of them are not divisible by 3 , nor by 5 , nor by 7 ?
ii) How many are not divisible by 5 and 7 but divisible by 3 ?
b) Obtain the CNF and DNF of the following formulae given below:[8]
i) $\mathrm{p} \wedge(\mathrm{p}->\mathrm{q})$
ii) $\sim(p \vee q)->(p \wedge q)$

Q3) a) Define each of the following with examples :
i) Semi Group
ii) Group
iii) Abelian Group
iv) Cyclic Group
b) For the following, determine whether the binary operation $*$ is commutative or associative: on N , where $\mathrm{a} * \mathrm{~b}=\max (\mathrm{a}, \mathrm{b})$ OR

Q4) a) Define each of the following with examples :
i) Rings
ii) Cosets
iii) Subrings
iv) Homomorphism of Groups
b) Show that $\{1,2,3\}$ under multiplication modulo 4 is not a group but that $\{1,2,3,4\}$ under multiplication modulo 5 is group.

Q5) a) Let $\mathrm{A}=(1,2,3,4)$ and $\mathrm{R}=((1,2),(2,4),(1,3),(3,2)\}$. Find the transitive closure of R by Warshall's algorithm.
b) Let $\mathrm{A}=\{\mathrm{a}, \mathrm{b}, \mathrm{c}\}$. show that $(\mathrm{P}(\mathrm{A}), \mathrm{c})$ is a poset and draw its Hasse diagram.
c) Define Chains and Antichains.

## OR

Q6) a) Let R be a binary relation on the set of all positive integers such that $R=\{(a, b) \mid a-b$ is an odd positive integer $\}$
Is R reflexive, symmetric, antisymmetric, transitive?
Is R an equivalence relation? A partial ordering relation.
b) Function f, g, $h$ are defined on a set

$$
\begin{align*}
& \mathrm{X}=(1,2,3) \text { as }  \tag{8}\\
& \mathrm{f}=((1,2),(2,3),(3,1)\} \\
& \mathrm{g}=\{(1,2),(2,1),(3,1)\} \\
& \mathrm{h}=((1,1),(2,2),(3,1)\}
\end{align*}
$$

i) Find fog, gof. Are they equal?
ii) Find fogoh and fohog.
c) Define partial function.

## SECTION - II

Q7) a) Define Following with examples :
i) Graph
ii) Self loop and parallel edges
iii) Multiple Graphs
iv) Weighted Graph
b) Prove that the number of vertices od odd degree in a graph is always even.

## OR

Q8) a) Determine the number of edges in a graph with 6 nodes, 2 of degree 4 and 4 of degree 2 . Draw two such graphs.
b) Define Isomorphism in graphs and sub graph with example. Find whether $\mathrm{k}_{6}$ and $\mathrm{K}_{3,3}$ are isomorphic or not?

Q9) a) Show that it is possible to draw a tree with 10 vertices which has vertices either of degree 1 or of degree 3. Draw the tree. Is it possible to draw the same type of tree with 11 vertices
b) Define tree and its properties. Is it possible to draw a tree with five vertices having degree $1,1,2,2,4$ ?

Q10)a) Construct an optimal tree for the weight $8,9,10,11,13,15,22$. Find the weight of the optimal tree.
[8]
b) Suppose data items A, B, C, D, E, F, G occur with the following probability distribution :

| Data Item | A | B | C | D | E | F | G |
| :--- | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Probability | 10 | 30 | 05 | 15 | 20 | 15 | 05 |

Construct a Huffiman code for the data. What is the minimum weighted path length?

Q11)a) Find the permutation of the set $\mathrm{A}=\{1,2,3,4\}$ taking the elements two at a times.
b) Suppose repetitions are not possible.
i) How many three digit numbers can be formed from six digits 2 , $3,4,5,7,9$ ?
ii) How many of these numbers less than 400 ?
iii) How many even?
iv) How many are multiples of 5?
c) Given a binary communication channel when $\mathrm{A}=$ input and $\mathrm{B}=$ output. Let $\mathrm{P}(\mathrm{A})=0.4, \mathrm{P}(\mathrm{B} / \mathrm{A})=0.9, \mathrm{P}(\mathrm{B} / \mathrm{A})=0.6$. Find the mutual information (i) between A and B , (ii) between A and B .

## OR

Q12)a) Four persons enter a bus in which there are six vacant seats. In how many ways can they take their places?
[2]
b) Given that a students had prepared, the probability of passing a certain entrance exam 0.99. Given that a student did not prepare, the probability of passing the entrance exam is 0.05 . Assume that the probability of preparing is 0.7 . The stwdentufailsin thenexam. What is the probability that he or she did not prepare?
c) In a test an examinee either guesses or copies or knows the answer to multiple Choice questions with 4 choices, only one answer being correct. The probability that he makes a guess is $1 / 3$, the probability that he copies the answer is $1 / 6$. The probability that his answer is correct, given that he copies it is $1 / 8$. Find the probability that he knew the answer to that question, given that he correctly answers it.

