

Roll No.

Total No. of Questions : 09]

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B.Tech. (Sem. - 3rd)
DISCRETE STRUCTURES
SUBJECT CODE : CS - 203

Paper ID : [A0452]

[Note: Please fill subject code and paper ID on OMR]

Time : 03 Hours

Maximum Marks : 60

Instruction to Candidates:

- 1) Section - A is Compulsory.
- 2) Attempt any Four questions from Section - B.
- 3) Attempt any Two questions from Section - C.

Section - A

(10 × 2 = 20)

Q1)

- a) Define function and relation. Give example of each.
- b) Define semi group and Monoid.
- c) Prove that ${}^{n+1}C_r = {}^nC_{r-1} + {}^nC_r$.
- d) Find 'n' if $P(n,2) = 72$.
- e) What is Eulerian graph. Give example?
- f) Define one-one and onto function. Give example.
- g) What is Ring Homomorphism.
- h) Define Permutation. How many permutations are possible on a set $S = (1, 2, 3, 4, 5)$.
- i) Find the product of the following permutations

$$\begin{pmatrix} 1 & 2 & 3 & 4 \\ 2 & 4 & 1 & 3 \end{pmatrix} \begin{pmatrix} 1 & 2 & 3 & 4 \\ 4 & 3 & 1 & 2 \end{pmatrix}$$

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- j) Give an example of equivalence relation.

Section - B

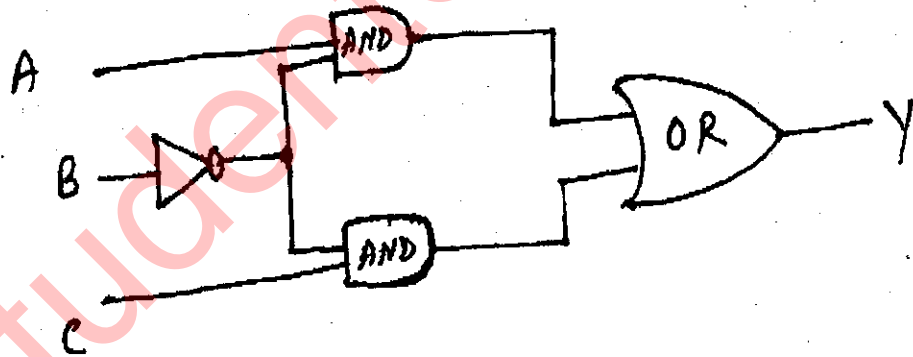
(4 × 5 = 20)

- Q2) State and prove D'Morgan's law.
- Q3) Prove that Inclusion relation on the set of sets is an equivalence relation.
- Q4) Suppose $f : G \rightarrow G'$ is a group homomorphism. Prove that $f(e) = e'$ and $f(a^{-1}) = f(a)^{-1}$
- Q5) Prove that $V - E + R = 2$, where V is the number of vertices, E the number of edges and R the number of regions in a graph.
- Q6) Let $A = \{1, 2, 3, 4, 6, 8, 9, 12, 18, 24\}$ be ordered by the relation "x" divides "y". Draw Hasse diagram of this relation.

Section - C

(2 × 10 = 20)

- Q7) Express the output Y as a Boolean expression in the inputs A, B, C for the logic circuits in the following figure.



- Q8) A bag contains six white marbles and five red marbles. Find the number of ways four marbles can be drawn from the bag if.
- they can be any color.
 - two must be white and two red.

- Q9) Let $X = \{1, 2, \dots, 8, 9\}$. Determine whether or not each of the following is a partition of X.

(a) $\{\{1, 3, 6\}, \{2, 8\}, \{5, 7, 9\}\}$

(b) $\{\{1, 5, 7\}, \{2, 4, 8, 9\}, \{3, 5, 6\}\}$