Roll No. ....

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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

Q1) *(10 x 2 = 20)*

a) How many edges are there in a graph with 10 vertices each of degree six?

b) Define the terms (i) Euler circuit (ii) Complete graph.

c) Give an example of a connected graph that has both a Hamilton cycle and an Euler circuit.

d) What is the chromatic number of $K_{2,3}$?

e) Define an equivalence relation and give an example of the same.

f) Give an example of a finite group?

g) Show that {0} is an ideal in any ring R.

h) Define a quotient ring and give an example for the same.

i) State (i) Absorption law (ii) Idempotent law, in a Boolean algebra.

j) What is the generating function for the sequence $S_n = 2^n$?

Section - B

(4 x 5 = 20)

Q2) In a class of 60 boys, 45 boys play cards and 30 boys play carom. How many boys play both games? How many plays cards only and how many plays caroms only?

Q3) Solve the recurrence relation $S(n) - 6S(n-1) + 9S(n-2) = 3^{n+1}$.

Q4) Let R be the relation on the set of ordered pairs of positive integers such that (a, b)R (c, d) if and only if $a + d = b + c$. Show that R is an equivalence relation.

Q5) If H and K are two subgroups of a group G, then show that $H \cap K$ is also a subgroup of G.

Q6) Let {B, +, . ,'} is a Boolean algebra. For $a \in B$, if $x \in B$ be such that $a + x = 1$ and $a. x = 0$, then show that $x = a'$. Also show that $0' = 1$ and $1' = 0$.

Section - C

(2 x 10 = 20)

Q7) Show that every field is an integral domain.

Q8) Consider any connected planar graph G = (V, E) having R regions, V vertices and E edges. Show that $V + R - E = 2$.

Q9) Use generating functions to solve the recurrence relation $a_k = a_{k-1} + 2a_{k-2} + 2^k$ with initial conditions $a_0 = 4$ and $a_1 = 12$.