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Program: B.Tech. (Batch 2018 onwards)
Semester: 4th
Name of Subject: Discrete Mathematics

Subject Code: PCCS-103
Paper ID: 16213
Scientific calculator is not allowed.

Time Allowed: 03 Hours

Max. Marks: 60

NOTE:

1) Parts A and B are compulsory.
2) Part-C has Two Questions Q8 and Q9. Both are compulsory, but with internal choice.
3) Any missing data may be assumed appropriately.

Part – A   [Marks: 02 each]

Q1.

a) Show that identity element of a group is always unique.

b) List different kinds of set operations.

c) Define Pigeonhole principle with the help of suitable example.

d) List all partitions of set $A = \{1, 2, 3\}$

e) Prove that the given statement is tautology

$\sim (p \wedge q) \Leftrightarrow \sim p \vee \sim q$

f) Explain the concept of Homomorphism of rings.

Part – B   [Marks: 04 each]

Q2. In a group of 100 students, 72 students can speak English and 43 students can speak Hindi.

a) Find the number of students who can speak English only.

b) Find the number of students who can speak Hindi only.

c) Find the number of students who can speak both English and Hindi.

Q3. Determine all solutions of the recurrence relation $A_n = 5A_{n-1} - 6A_{n-2} + 7^n$

Q4. Let $f: R \rightarrow R$ and $g: R \rightarrow R$ be the two functions on R defined by $f(x) = 2x+3$ and $g(x) = x^2$. Show that $fog \neq gof$

Q5. Minimize the following switching circuit $\Sigma m\ (1, 5, 6, 7, 11, 12, 13, 15)$

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Q6. Discover the number of arrangements that can be formed from word ELEVEN. How many of them begin and end with E? How many of them have all three E's together.

Q7. If R be a ring with unity, $(xy)^2 = x^2y^2$, For all x,y $\in$ R, Then prove that R is commutative.

Part – C   **[Marks: 12 each]**

Q8. For recurrence relation S(t) - 2S(t-1) - 3S(t-2) =0 where S (0)=3, S(1)=1 , Find the generating function and sequence that satisfies it.
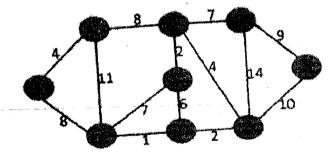
OR

Solve $S(k) - 6S(k-1) + 9S(k-2) = 3^k$

Q9. Construct a group G = {1, 2, 3, 4, 5, 6} under multiplication modulo 7.

a) Find the multiplication table of G.

b) Prove that G is a group.

c) Find 2^{-1}, 3^{-1} and 1^{-1}

d) Find the orders and subgroups generated by 2 and 3

OR

Solve the following graph to find minimum spanning tree using:

a) Kruskal's Algorithm.

b) Prim's Algorithm.

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