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Total No. of Questions: [09]

Total No. of Printed Pages: 1

**BCA (Semester – 3<sup>rd</sup>)**  
**DISCRETE STRUCTURES**  
**Subject Code: BCAP1314**  
**Paper ID: [160113]**

**Time: 03 Hours**

**Maximum Marks: 60**

**Instruction for candidates:**

1. Section A is compulsory. It consists of 10 parts of two marks each.
2. Section B consist of 5 questions of 5 marks each. The student has to attempt any 4 questions out of it.
3. Section C consist of 3 questions of 10 marks each. The student has to attempt any 2 questions.

**Section – A**

**(2 marks each)**

- Q1. Attempt the following:
- a) Write down the truth table of  $p \leftrightarrow q \leftrightarrow r$ .
  - b) Define a complete binary tree.
  - c) State fundamental theorem on Relations.
  - d) Define permutation and combination.
  - e) Define Tautology.
  - f) Define Scalar matrix with example.
  - g) Define an abelian group.
  - h) Find the Cartesian Product  $A \times A$  if  $A = \{0, 1, 3\}$ .
  - i) Draw a Complete graph with 5 vertices.
  - j) State pigeonhole principle.

**Section – B**

**(5 marks each)**

- Q2. Prove that  $(p \leftrightarrow q) \equiv (p \rightarrow q) \wedge (q \rightarrow p)$
- Q3. Prove that every finite integral domain is a field.
- Q4. If  $A = \{1, 2, 3\}$ . List all permutations on A and prove that it is a group.
- Q5. Show that intersection of two partial order relations is a partial order relation. But union of two partial order relations need not be a partial order relation. Give suitable example.
- Q6. Explain the following with suitable examples:
- |                      |                     |
|----------------------|---------------------|
| a) Connected graph   | b) Planar graph     |
| c) Hamiltonian Graph | d) Chromatic number |

**Section – C**

**(10 marks each)**

- Q7. Simplify the Boolean expression  $f(x, y, z) = (x \wedge y \wedge z) \vee (x \wedge y \wedge \bar{z})$ . And find its conjunctive normal forms.
- Q8. Given the following **inorder** and **preorder** traversal reconstruct a binary tree
- Inorder – D, G, B, E, A, F, I, C  
Preorder – A, B, D, E, H, C, F, I
- Q9. Solve the recurrence relation

$$S(n) + 5S(n - 1) + 6S(n - 2) = 3n^2$$

where  $S(0) = 1, S(1) = 2$