Roll No…….. **Total No. of Printed Pages: 1**
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BCA (Semester – 3rd)
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 × 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 $f\ (x,\ y,\ z)\ =\ (x \wedge y \wedge z) \vee (x \wedge y \wedge z)$. 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

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

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