S.No. : 331 **BCS 3301**

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Following Paper ID and Roll No. to be filled in your Answer Book.

PAPER ID : 33211 Roll No. [redacted]

B. Tech. Examination 2023-24

(Odd Semester)

DISCRETE MATHEMATICS

Time : Three Hours] *[Maximum Marks : 60*

Note :– Attempt all questions.

SECTION – A

1. Attempt all parts of the following : 8×1=8

(a) If P = {1, 2} find P × P × P.

{1,2} {1,2}

(b) Give an example of a relation which is reflexive but neither symmetric nor transitive?

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44

(c) Define Bijective function.

(d) Differentiate complemented lattice and disturbed lattice.

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(e) Define recurrence relation with example.

(f) Define universal quantifiers and existential quantifiers.

(g) What will be the chromatic number of complete graph with n-vertices?

(h) What do you mean by Planar Graph?

SECTION – B

2. Attempt any two parts of the following : $2 \times 6 = 12$

(a) Comptue transitive closure of the relation $R = \{(1, 1), (1, 4), (2, 1), (2, 2), (3, 4), (4, 4)\}$ defined over non empty set $A = \{1, 2.3.4\}$.

(b) Prove that the set $S = \{0, 1, 2, 3\}$ forms a ring under addition and multiplication modulo 4 but not a field.

(c) Solve $E(x, y, z, t) = \Sigma(0, 2, 6, 8, 10, 12, 14, 15)$ using K-map.

(d) Solve the recurrence relation using generating function $a_{r+2} - 5a_{r+1} + 6a_r = 2$ given that $a_0 = 3$ and $a_1 = 7$.

SECTION – C

Note :– Attempt all questions. Attempt any two parts from each question. $5 \times 8 = 40$

3. (a) Use the principle of mathematical induction to verify that :

$$P(n) : P(n) = 1 + 4 + 7 + \dots + (3n-2) = n(3n-1)/2$$

(b) Let $A = \{1, 2, 3\}$, $B = \{p, q\}$ and $C = \{a, b\}$. Let $f : A \rightarrow B$ is $f = \{(1, p), (2, p), (3, p)\}$ and $g : B \rightarrow C$ is given by $\{(p, b), (q, b)\}$. Find g o f.

(c) Prove that :

$$A - (B \cap C) = (A - B) \cup (A - C)$$

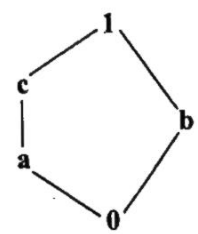
4. (a) Let $G = \{1, -1, i, -i\}$ with the binary operation multiplication be an algebraic structure, where $i^2 = -1$:

(i) Determine whether G is an Abelian group.

(ii) If G is cyclic group, then determine the generate of G.

(b) State and prove the Lagrange's theorem.

(c) Define a lattice. Verify whether the lattice given by the Has diagram in the figure below is distributive :



5. (a) Use rules of inference to show that the hypothesis "Randy wor hard," "If Randy works hard, then he is a dull boy," and "If Randy is a dull boy, then he will not get the job" imply the conclusive "Randy will not get the job".

(b) Using truth table verify that the proposition $(P \wedge Q) \wedge \neg (P \vee Q)$ a contradiction.

(c) Define a binary tree. A binary tree has 11 nodes. It's in-order and preorder traversals node sequences are :

Preorder : A B D H I E J K C F G

In-order : H D I B J E K A F C G

Draw the binary tree.

6. (a) Show that in any graph the number of odd degree vertices is even.

(b) What is the solution of the recurrence relation $a_r = 2a_{r-1} + 1$ given that $a_0 = 0$.

(c) How many people must you have to guarantee that at least 5 of them will have birthday on the same month.

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