KADI SERVA VISHWAVIDHYALAYA,

BE Semester-3(May-2023)

Discrete Mathematics (CC320B-N)　　　　　　　　　　　**Max Marks: 70**

Date: 09/05/2023　　　　　　　　　　　　　　　　　**Duration: 3hr**

Instruction:　1) Answer each section in separate answer sheet

　　　　　　　2) Use of scientific calculator is permitted

　　　　　　　3) All questions are compulsory

　　　　　　　4). Indicate clearly, the option you attempted along with its respective question number

　　　　　　　5) use the last page of main supplementary for rough work.

Section-1

Q.1 **(a)** Draw the Hasse diagram of $<P(A), \subseteq>$ where A= {a, b, c} also find cover of element.　　[5]

(b) Show that cube roots of unity form an abelian group under multiplication.　　[5]

(c) Let f: $Z \rightarrow Z$ be a function define by f(x) = 9x + 5. Then check whether the function f is one-one and onto or not.　　[5]

OR

(c) Define cyclic group. Show that $(z_7, +_7)$ is a cyclic group also find the generator of this group.　　[5]

Q.2 **(a)** Expressed the Boolean expression $x_1 * x_2$ in an equivalent sum of products canonical form of three variable.　　[5]
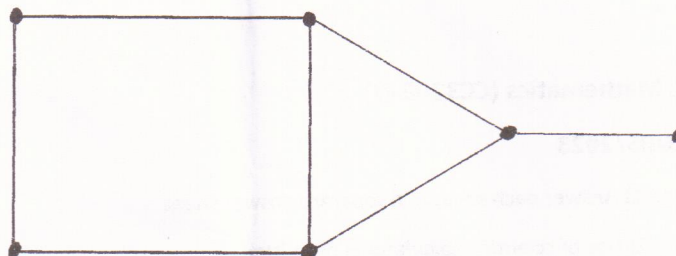
(b) Define Right and Left coset. Let G= (z, +) and H= (5z, +) Then find all the possible left and right coset.　　[5]

OR

(a) Show that $< \{1, 3, 6, 15\}, \leq>$ is not a sub lattice of $<s_{30}, D>$.　　[5]

(b) Define Boolean algebra. Show that $<s_{30}, D>$ is a Boolean algebra.　　[5]

Q.3 (a) Define Handshaking Lemma and verify it for the following graph.   [5]

(b) Prove that $< \{1, 3, 3^2, 3^3, \cdots, D>$ are Poset and chain.   [5]

OR

(a) Define the following terms of undirected graph with example.   [5]
1) Simple graph (2) Multiple Graph (3) Bipartite Graphs
4) Walk

(b) Define Join-irreducible elements, Meet-irreducible elements, Atom and Anti-atoms. Find the Join-irreducible elements, Meet-irreducible elements, Atom and Anti-atoms for the lattice $<s_{30}, D>$.   [5]

Section-2

Q.4 (a) Prove that the set $G = \{0, 1, 2, 3, 4\}$ is an abelian group under addition modulo 5.   [5]

(b) Show that $<s_{30}, D>$ is bounded and complemented lattice.   [5]

(c) A relation is defined on set Z is   [5]
$R = \{(x, y)/ x - y$ divided by 7$\}$ then Prove that the relation R is an equivalence relation.

OR

(c) Let p, q and r be the statement then construct the truth table for the statement formula A, A: $(\sim p \wedge q) \rightarrow r$ [5]

Q.5 (a) Prove that the set $G = \{1, i, -1, -i\}$ is a group under the operation multiplication.   [5]

(b) Define the following term with graph.   [5]
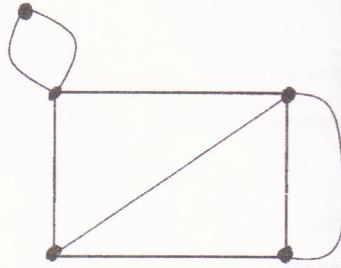1) degree 2) in degree 3) out degree

OR

(a) Show that (s_2, o) is an abelian group under the operation composition.   [5]

(b) Expressed the Boolean expression $(x_1 \oplus x_2)' * x_3$ in an [5] equivalent products of sum canonical form.

Q.6 (a) Define the following term with graph. [5]
1) Tree 2) Spanning Tree 3) Rooted Tree

(b) Find an Incident Matrix of a following Graph. [5]

OR

(a) Define Graph isomorphism with example. [5]

(b) If p and q are any two statement then verify [5]
$\sim (p \leftrightarrow q) = \sim p \leftrightarrow q = p \leftrightarrow \sim q$

Best of Luck