Exam Seat No : .....

KADI SARVA VISHWAVIDYALAYA
B.E 3rd SEMESTER EXAMINATION (November 2024)
SUBJECT: Discrete Mathematics (Code: CC302B N)

Date: 12/11/2024 **Time: 3 hour** **Marks: 70**

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) A relation is define on set $\mathbb{Z}$ is $R = \{(x,y)/\ x-y$ divided by $5\}$ then check that R is equivalence relation or not. [05]

(b) Prove that $\langle\{1, 5, 5^2, 5^3, 5^4, ...\}, D\rangle$ is are poset and chain. [05]

(c) Show that cube root of unity form a group under multiplication. [05]

OR

(c) Let p, q and r be the statement then construct the truth table for the statement formula A, $A: (\sim(p \vee q)) \rightarrow (q \wedge p)$. [05]

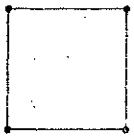
Q.2 (a) Draw the Hasse Diagram for the following POSETs and Where D is the Division Relation. [05]
(i) $< S_{60}, D >$ (ii) $< S_{70}, D >$

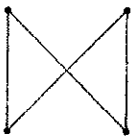
(b) Let S be the set of all integers from 10 to 99 which are neither divisible by 3 nor divisible by 5 then find number of elements in S. [05]

OR

Q.2 (a) Prove that (S_3, o) is non commutative group. [05]

(b) Prove that the pair of the graphs are isomorphic [05]





Q.3 (a) Show that $\langle S_{1001}, *, \oplus \rangle$ is lattice. [05]

(b) If p and q are any two statement then check that the statement formula A, $A: (\sim p \wedge q) \longrightarrow (\sim(q \longrightarrow p))$ is tautology. [05]

OR

Q.3 (a) Show that $\langle \mathbb{P}(X), \subseteq \rangle$ is bounded lattice. where $X = \{a, b, c\}$. [05]

(b) Given 20 vertices, each with a degree of 3, into how many regions does a representation of this planar graph partition the plane? [05]

Section:2

Q.4 (a) Prove that the set $\langle G = \{0, 1, 2, 3, 4, 5, 6\}, +_7 \rangle$ is an abelian group. [05]

(b) Prove that Sub group $H = \{-1, 1\}$ is normal subgroup for the group $\langle G = \{1, -1, i, -i\}, \times \rangle$. [05]

(c) Define the following terms with example and truth table . [05]
(i) Disjunction (ii) Conjunction

OR

(c) Define the following terms of graph with example. [05]
(i) Directed graph (ii) Isolated and Pendant vertex. (iii) Degree of vertex directed and undirected (iv)Multiple edges (v)Pseudo graph.

Q.5 (a) Let $R = \{(1,1), (1,2), (1,3), (1,4), (2,3), (3,3), (2,2), (3,2), (3,4), (4,4), (4,1), (4,3)\}$ be the relation define on set $A = \{1, 2, 3, 4\}$ then find the matrix for relation R, draw its diagraph and also find in-degree and out-degree. [05]

(b) Is it possible to construct a graph with 12 vertices such that 2 of the vertices have degree 3 and remaining vertices have degree 4 ? [05]

OR

Q.5 (a) Show that $\langle S_{30}, *, \oplus, 0, 1, ' \rangle$ is boolean algebra. [05]

(b) Define the following terms for Undirected graphs with example. [05]
(i) Trail (ii) Euler Graph (iii) Hamiltonian Graph (iv) Planner Graph (v) Bipartite Graph

Q.6 (a) Draw the directed graph with incidence matrix shown below : [05]

To edges

$$A = \begin{array}{c} \text{From vertex} \\ a \\ b \\ c \\ d \\ e \end{array} \begin{bmatrix} e_1 & e_2 & e_3 & e_4 & e_5 & e_6 & e_7 & e_8 & e_9 \\ -1 & -1 & 0 & 1 & 1 & 0 & 0 & 0 & 0 \\ 1 & 0 & 1 & 0 & 0 & 0 & -1 & 0 & 0 \\ 0 & 1 & -1 & 0 & 0 & -1 & 0 & 0 & 1 \\ 0 & 0 & 0 & -1 & 0 & 1 & 1 & 1 & 0 \\ 0 & 0 & 0 & 0 & -1 & 0 & 0 & -1 & -1 \end{bmatrix}$$

(b) Define Join Irreducible and Meet Irreducible. Find the Join and meet Irreducible, Atom, and Anti-atom of the Lattice $\langle S_{30}, D \rangle$. [05]

OR

Q.6 (a) Define following terms with graph (i) Tree (ii) Rooted tree (iii) Binary tree (iv) Spanning tree (v) Subgraph [05]

(b) Let $f : \mathbb{Z} \longrightarrow \mathbb{Z}$ be define by $f(x) = 4x + 3$. Then check that f is one-one and onto. [05]