Seat No._____

# GANPAT UNIVERSITY

## B. Tech Semester-IV(CE/IT) CBCS Regular Examination May-2014

## Subject: 2HS 401 Discrete Mathematics

**Time: 3 hours** **Total Marks: 70**

**Instructions:**

1. All Questions are compulsory.
2. Write answer of each section in separate answer book.
3. Figure to right indicates the indicates marks.

## SECTION - I

**Question-1**

(A) Show that Relation R on $\mathbb{Z}$ defined by $x \equiv y(mod\ m) \Leftrightarrow (x-y)$ is divisible by $m$ is an equivalence relation. [4]

(B) For Bounded lattice $< L, *, \oplus, O, I >$ prove the following identities.
(i) $a*0 = 0$ (ii) $a*1 = a$ (iii) $a \oplus 0 = a$ (iv) $a \oplus 1 = 1$ [4]

(C) Draw the Hasse Diagram for given Po-sets. (i) $< S_{30}, D >$ (i) $< S_{60}, D >$ [4]

**OR**

**Question-1**

(A) Define Lattice. State and Prove Bridge Theorem for lattice as a Po-set. [6]

(B) Define Distributive lattice. Prove that every chain is a Distributive lattice. [6]

**Question-2**

(A) Define Atoms and Join-irreducible for Boolean Algebra find the same for following lattices.
(i) $< S_{30}, D >$ (i) $< S_{60}, D >$ [4]

(B) For any $a \in < B, *, \oplus, ', O, I >$ prove that $\{a'\}' = a$ [3]

(C) State all the properties of Boolean algebra. [4]

**OR**

**Question-2**

(A) Find all the sub-boolean algebra of $< S_{210}, D >$ [4]

(B) State and prove Stone's Representation theorem. [4]

(C) Convert $A \oplus (B*C)$ into min-terms. [3]

**Question-3 Attempt any Three**

(A) State and prove De-Morgan's laws for fuzzy subsets. [4]

(B) Prove that for two sub-lattices $L_1$ and $L_2$ , $L_1 \cap L_2$ is a sub-lattice. Is $L_1 \cup L_2$ a sub-lattice? Justify your answer. [4]

(C) Give an example of Lattice which is Complemented but not Distributive , with Explanation. [4]

(D) Compute $A' - B'$ , $B' - A'$ , $A - B$ and $B - A$ for two fuzzy subsets $A$ and $B$ , where
$A = \{(x_1/0.3)\ ,\ (x_2/0.5)\ ,\ (x_3/0.9)\ ,\ (x_4/0.1)\}$ and
$B = \{(x_1/0.7)\ ,\ (x_2/0.2)\ ,\ (x_3/0.4)\ ,\ (x_4/1)\}$. [4]

## SECTION - II

**Question-4**

(A) Define Group. P. T. $< Z_6, +_6 >$ is a group under the $+_6$ addition modulo 6. [4]

(B) P.T. For group $G$, $(i)\ (ab)^{-1} = b^{-1}a^{-1}$ $(ii)\ ax = ay \Rightarrow x = y\ , \forall a, b, x, y \in G$ [4]

(C) P. T. $< Q^+, * >$ is abelian group, $Q^+$ is a set of all positive rational numbers and $*$ is defined by $a*b = \frac{ab}{5}$. [4]

**OR**

**Question-4**

(A) Define Sub-Group. Find all possible sub-groups of a group $< Z, + >$ [4]

(B) Prove that;

(i) Every cyclic group is abelian. [2]

(ii) A group of prime order can't have a proper subgroup. [2]

(C) Let $H$ be a sub-group of group $G$. For $a \in G$ show that $aH$ and $Ha$ formed by $a \in G$ with respect to $H$ are either identical or disjoint. [4]

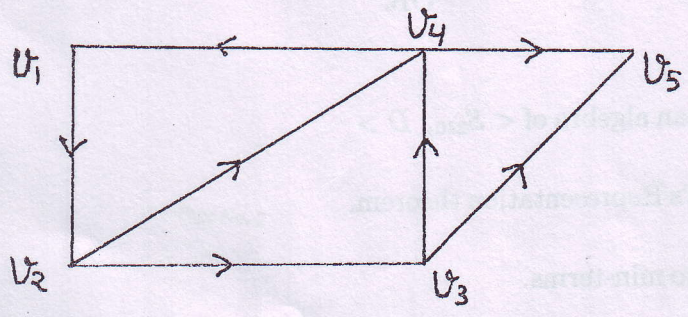
**Question-5 Attempt any Three**

(A) Is $< \mathbb{R} - \{1\}, * >$ abelian group? where $a*b = a+b-ab\ \forall a, b \in \mathbb{R} - \{1\}$. [4]

(B) Explain Predicates in detail. [4]

(C) Define Statement function , Variables and Quantifiers. [4]

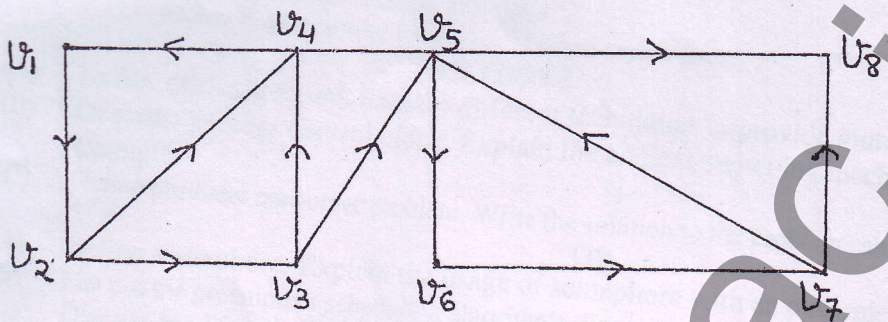
(D) Define Node Base. Find node base for the following graph. [4]



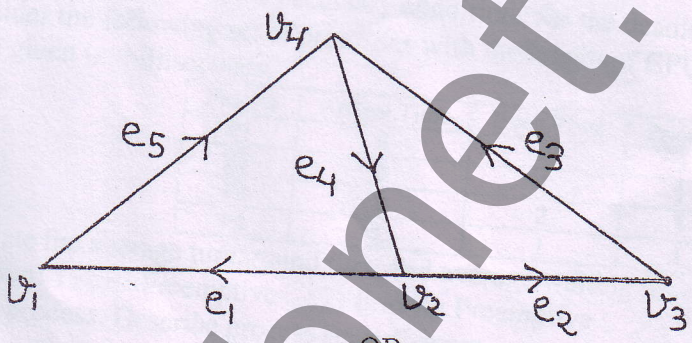
**Question-6**

(A) Define following terms by taking suitable graph.
(i) Isolated vertex (ii) Pseudo graph (iii) In-degree of vertex (iv) Path of graph [4]

(B) Define. Weakly Connected , Unilaterally Connected and Strongly Connected Graph.
Decide the type of Connectedness of the following graph. [4]




(C) Define Incident Matrix. Find it for following graph. [3]

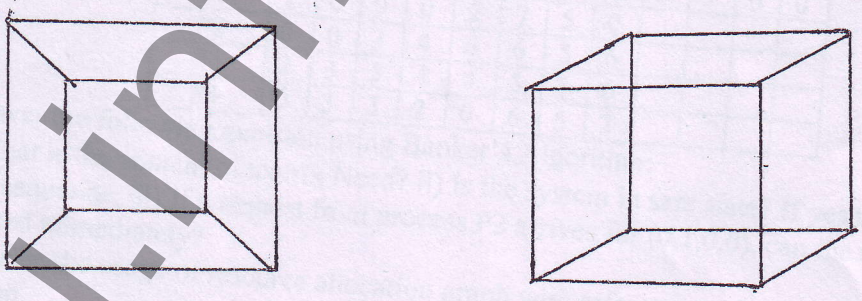



OR

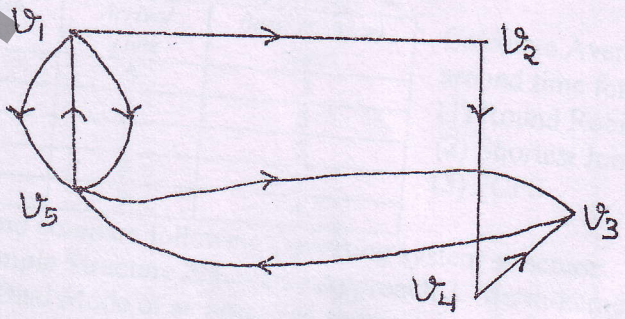
**Question-6**

(A) For un-directed graph G, Prove that $\sum_{v \in V} deg(v) = 2 \cdot \{total\ no.\ edges\ of\ G\}$ [4]

(B) Define Isomorphic Graphs. Check whether the following graphs are isomorphic? [4]



(C) Define Adjacent Matrix. Find it for following graph. [3]




End of Paper