Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

MCA - SEMESTER–I • EXAMINATION – SUMMER 2013

Subject Code: 2610003 **Date: 11-06-2013**

Subject Name: Discrete Mathematics for Computer Science (DMCS)

Time: 10:30am to 13:00pm **Total Marks: 70**

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

Q.1 **(a)**

i) Consider the statement, "If today is Monday, then I will go for a walk". Write converse, inverse and contrapositive for the given statement. **04**

ii) Test whether the given arguments are logically valid or not. **03**
"If it rains, the prices of vegetables go up. The prices of vegetables go up. So it rains."

(b) Using indirect proof technique, show that if a^2+3 is odd, then a is even. **07**

Q.2 **(a)** Determine join-irreducible elements, meet-irreducible elements, atoms and antiatoms for the lattices shown in the Figure – 1. **07**

(b) Find all subalgebra of Boolean algebra $\langle S_{30}, \wedge, \vee, ', 0, 1 \rangle$. **07**

OR

(b) Find the prime implicants and minimal sum of products for the following: **07**

i) $\alpha(x,y,z) = xyz + xyz' + x'yz' + xy'z$

ii) $\beta(x,y,z) = x'y'z + x'yz + xy'z + xyz' + xyz$

Q.3 **(a)** Let Z be set of all integers and R be relation on Z defined by for a,b Є Z, aRb, if $b = a^r$ for some integer r, then $\langle Z,R \rangle$ is a poset. **07**

(b) State and prove absorption law for lattice $\langle L, \leq \rangle$. **07**

OR

Q.3 **(a)** Draw Hasse Diagram for poset: $\langle S_{60}, D \rangle$; where aDb means a divides b. Write cover of each elements of S_{60} **07**

(b) Let A = { a , b } then show that $\langle P(A), \times \rangle$ is a lattice. **07**

Q.4 **(a)** Show that the set of cube roots of unity forms a group under multiplication. **07**

(b) Let (R , +) and (R^+ , *) be two groups with addition and multiplication respectively. Prove that the function **07**
$f : R \rightarrow R^+$ defined by $f(a) = e^x$; for all x Є R is an isomorphic from

R onto R^+ .

OR

Q.4 (a) Show that the set of all positive rational number forms an abelian group under the composition defined by a * b = ab/2 . **07**

Q.4 (b) Define: Cyclic Group. Find the generator of (Z_5^* , X_5). **07**

Q.5 (a) Find in-degree and out-degree of each node from the following adjacency matrix A and draw its diagraph. **07**

$$A = \begin{pmatrix} 1 & 1 & 1 \\ 1 & 1 & 1 \\ 1 & 1 & 1 \end{pmatrix}$$

(b) Convert given forest into binary tree. **07**
Refer Figure – 2

OR

Q.5 (a) Define with an example: Edge Simple and Node Simple **07**
Verify that, are the following graphs are isomorphic?
Refer Figure – 3

(b) Give all the leaf and branch nodes. **07**
Give all the sub-tree with roots which are nodes at level 1.
Refer Figure – 4

Figure – 1

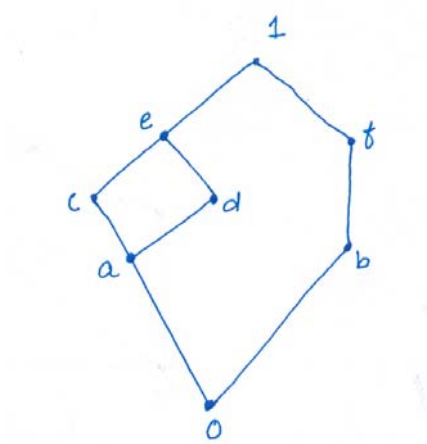


Figure – 2

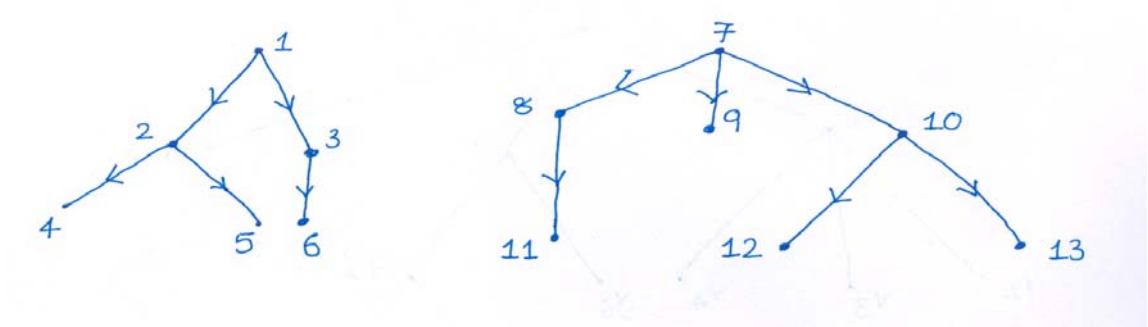


Figure – 3

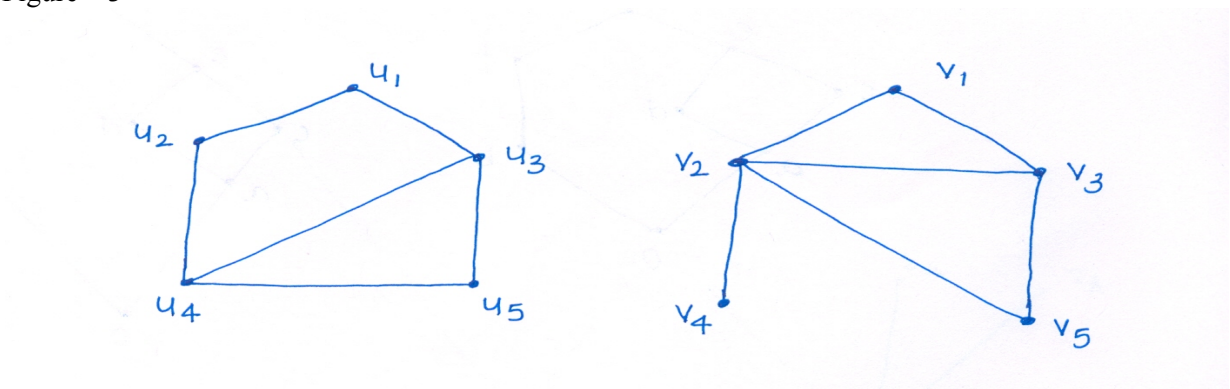
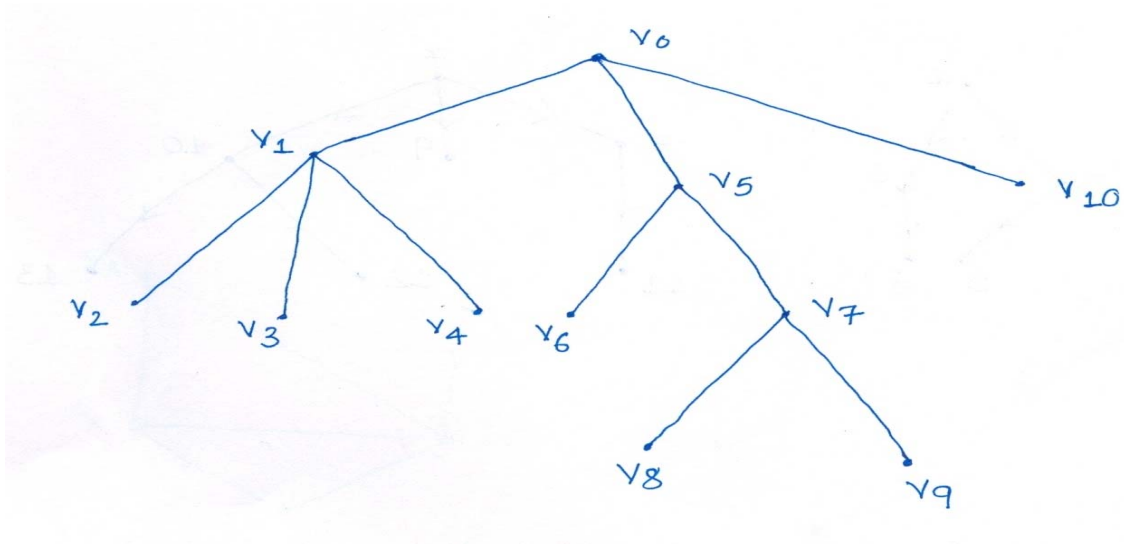


Figure – 4



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