01064

ADCA / MCA (II Yr.)

Term-End Examination

June, 2010

CS-07 : DISCRETE MATHEMATICS

Time : 3 hours *Maximum Marks : 75*

Note : *Question **1** is **compulsory**. Attempt **any three** from the rest.*

1. (a) Construct the truth table for : **3**

$$(P \vee \theta) \vee \neg P$$

(b) Express $P \downarrow \theta$ using $\uparrow$ only, where **4**

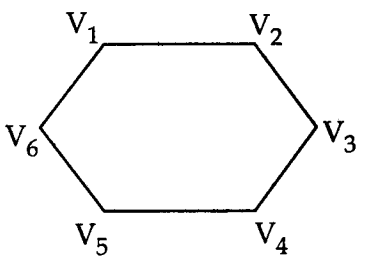
$P \downarrow \theta \equiv \neg (P \vee \theta)$ and $P \uparrow \theta \equiv \neg (P \wedge \theta)$.

(c) Let there be a graph G with adjacency matrix as follows : **5**

$$A(G) = \begin{bmatrix} 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \\ 0 & 1 & 0 & 0 & 1 \\ 0 & 0 & 1 & 1 & 0 \end{bmatrix}$$

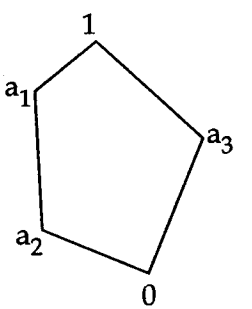
check if G is connected.

(d) What is a bipartite graph ? Check if following graph is bipartite. **3**



(e) If $x=(1\ 2\ 3)$, $y=(2\ 4\ 3)$, $z=(1\ 3\ 4)$ are cyclic permutation on $A=\{1, 2, 3, 4\}$. Then show that $xyz=1$, the identity map. **4**

(f) Show that the basic five element pentagonal lattice : **4**



is not distributive.

(g) Express number - 7 in 1s and 2s complement form. **3**

(h) Draw truth table for half adder and draw circuit diagram for half adder using AND, OR and NOT gate. **4**

2. (a) Find Disjunctive Normal Form (DNF) for 4

$p \rightarrow ((p \rightarrow q) \wedge \neg(\neg q \vee \neg p))$.

(b) Write the inverse, converse and contrapositive of $p \rightarrow (q \rightarrow r)$. 4

(c) Define well formed formula (wff). Also give an example of wff. 3

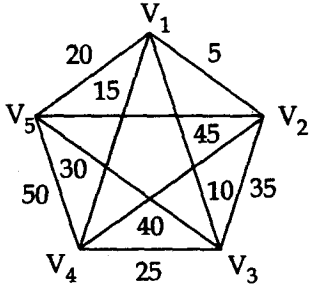
(d) Show that $\neg r$ is a valid conclusion from the premises 4

$p \rightarrow \neg q$

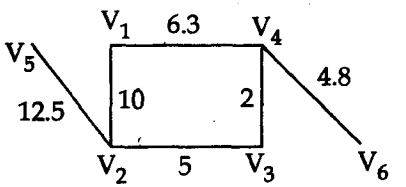
$r \rightarrow p$

q (where $\neg$ stands NOT) without using truth table.

3. (a) Solve for optimal tour the following graph using two optimal method. 8



(b) Find minimum spanning tree using Prim's algorithm for following graph : 5



(c) Define K-regular graph. Explain the concept with example. 2

4. (a) In a class of 25 students, 12 have taken mathematics, 8 have taken mathematics but not Biology. Find the number of students who have taken Mathematics and Biology and those who have taken Biology but not Mathematics. 6

(b) Given A = {1, 2, 3, 4}. Consider relation in A : R = {(1, 1), (2, 2), (2, 3), (3, 2), (4, 2), (4, 4)} 2

(i) Draw its directed graph. 4

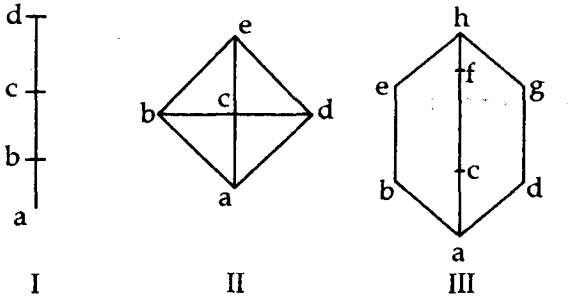
(ii) Is R reflexive, symmetric, transitive, antisymmetric ?

(c) Define following : 3

(i) Normal Fuzzy Set.

(ii) Support of a Fuzzy Set.

5. (a) Which of the following Hasse diagrams are lattices and which are not ? If not, why ? 3



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(b) If $(L, \cap, \cup)$ is a bounded distributive lattice. 3
then an element cannot have more than one complement. Prove it.

(c) Simplify the boolean function using k-map : 4

$F(a, b, c, d) = \Sigma(0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 11)$.

(d) Draw the logic network for the expression 3
$x^1y^1z + x^1yz + xy^1$.

(e) Let $A = \{1, 3, 9, 27, 81\}$. Draw Hasse diagram 2
of the poset $(A, /)$.