

ADCA / MCA (II Yr)
Term-End Examination
June, 2007

CS-07 : DISCRETE MATHEMATICS

Time : 3 hours

Maximum Marks : 75

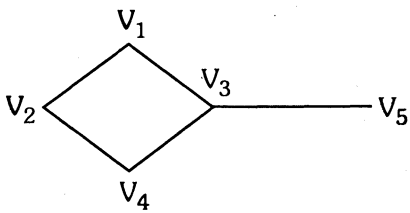
Note : Question no. 1 is **compulsory**. Answer any **three** questions from the rest.

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1. (a) Write the negation of each of the following conjunctions : 3
- (i) Paris is in France AND London is in England.
- (ii) $2 + 4 = 6$ and $7 < 12$.
- (b) Draw a graph representing the problem of three houses and three utilities, say, water, gas, electricity. 3
- (c) A non directed graph G has 8 edges. Find the number of vertices if the degree of each vertex in G is 2. 3
- (d) Let $A = \{1, 2, 3, 4\}$ be a set and R, S are relations on A defined as $R = \{(1, 2) (1, 3) (2, 4) (3, 2)\}$
 $S = \{(1, 4), (4, 3) (2, 3) (3, 1)\}$
 Find SoR . Construct the diagraph for R and S . 4

- (e) Write inverse, converse and contrapositive for
 $p \rightarrow (q \rightarrow r)$ 3
- (f) Let $A = \{x \in \mathbb{R} : x \neq 2\}$ and define
 $f(x) = \frac{x}{x-2} \quad \forall x \in A.$
 Show that f is one-one. 3
- (g) Draw Hasse diagram for partial ordering
 $\{(A, B) \mid A \subseteq B\}$ on the power set $P(S)$ where
 $S = \{a, b, c\}.$ 2
- (h) Draw $K_2, 5.$ 3
- (i) $A = \{4, 5, 7, 8, 10\}, B = \{4, 5, 9\},$
 $C = \{1, 4, 6, 9\}$
 State and verify, any one of the Distributive laws. 3
- (j) Show that pentagonal lattice is not modular. 3
2. (a) Show that $\lceil p$ is a valid conclusion from the premises 7

$$\begin{aligned}
 p &\Rightarrow q \\
 q &\Rightarrow r \\
 r &\Rightarrow s \\
 \lceil s
 \end{aligned}$$

- (b) Verify whether the following Graph G is connected or not. 5



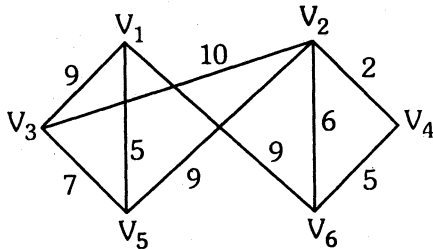
- (c) Show that the functions $f(x) = x^3$ and $g(x) = x^{1/3} \forall x \in \mathbb{R}$ are inverse of one another. 3

3. (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. 7

- (b) Obtain PCNF form for $(\neg p \Rightarrow r) \wedge (q \Leftrightarrow p)$ without truth table. 5

- (c) Draw switching circuit for $(x_1' x_2)' + x_1 x_2$ 3

4. (a) Find Minimum Spanning Tree using Kruskal's algorithm for 6



- (b) Let $X = \{1, 2, 3, 4, 5, 6\}$. Consider the fuzzy set A of X given by

$$A = \{(1, 0.2), (2, 0.5), (3, 0.7), (4, 1), (5, 0.8), (6, 0.3)\}.$$

Write all possible distinct α -level sets. 4

- (c) Let $A = \{1, 2, 3, 4\}$, $B = \{a, b, c, d\}$.
Let $f = \{(1, a), (2, a), (3, d), (4, c)\}$.
Show that f is a function but f^{-1} is not a function. 3
- (d) Find $29 + (-49)$ using 2's complement. 2
5. (a) Using Karnaugh map, simplify
 $X = A'B'CD + A'B'CD' + AB'C'D' + AB'CD'$ 7
- (b) If R is a relation in set of integers Z defined by
 $R = \{(x, y) : x, y \in Z, (x - y) \text{ is div by } 6\}$, then prove
that R is an equivalence relation. 4
- (c) In a distributive lattice, if an element has a
complement then prove that this complement is
unique. 4