

ADCA / MCA (II Yr)
Term-End Examination
June, 2008

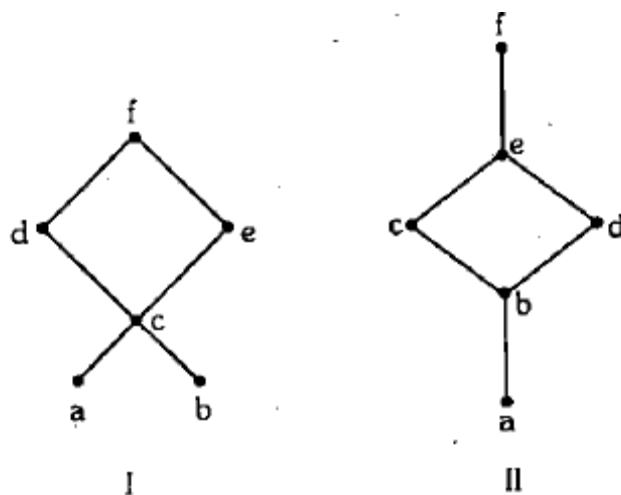
CS-07 : DISCRETE MATHEMATICS

Time : 3 hours

Maximum Marks : 75

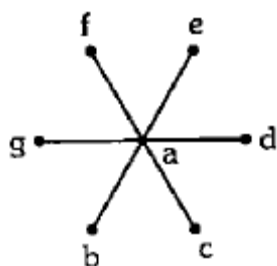
Note : Question no. 1 is **compulsory**. Answer any **three** questions from the rest.

1. (a) Let $A = \{a, b, c, d, e\}$, $B = \{e, f, g, h\}$ and $C = \{a, c, h, e\}$ be the three sets. Prove that
- $$|A \cup B \cup C| = |A| + |B| + |C| - |A \cap B| - |B \cap C| - |A \cap C| + |A \cap B \cap C|$$
- where $|A|$ represents cardinality of set A. 3
- (b) Let $A = \frac{0.4}{x_1} + \frac{0.5}{x_2} + \frac{0.7}{x_3} + \frac{0.9}{x_4} + \frac{1}{x_5}$
- $$B = \frac{0.6}{x_2} + \frac{0.8}{x_3} + \frac{1}{x_4} + \frac{0.2}{x_6}$$
- Find \bar{A} , $A \cup B$, $A \cap B$. 3
- (c) Which of the following is/are not a lattice and why? 2



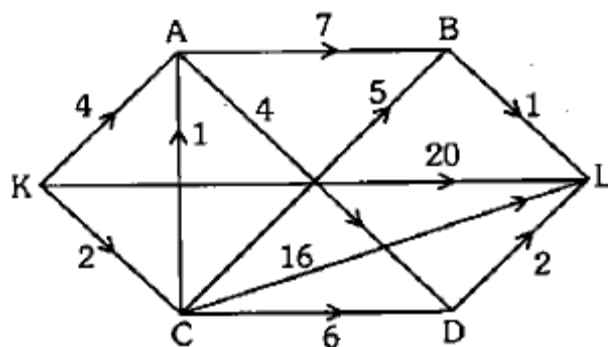
(d) Show that following graph is bipartite.

2



(e) Find the minimum distance between K and L using Dijkstra's algorithm.

5



(f) Draw K_5 and $K_{3,3}$ graph. What is so special about them?

3

(g) Express -47, in

1's complement form
2's complement form
sign magnitude representation.

Use 8 bit signed representation. 3

(h) Draw finite automata corresponding to the regular expression 2

$$(ab + cd)ef^*(g + h)i$$

(i) Write PCNF (Principle Disjunctive Normal Form) for the expressions 3

(i) $\sim P \vee Q$

(ii) $\sim(P \wedge Q)$

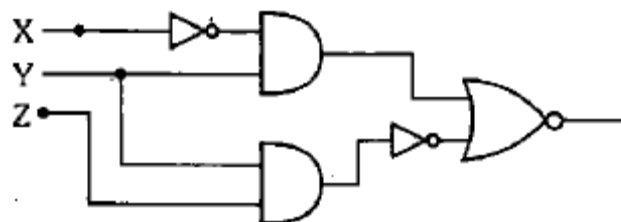
(j) Draw the diagram of 4 bit adder/subtractor circuit. The subtractor should be 2's complement subtractor. 4

2. (a) Write truth table for the following formulae :

(i) $((\sim q) \wedge (p \rightarrow q)) \leftrightarrow p$ 2

(ii) $(x_1 \wedge x_2) \vee (x_2 \wedge x_3) \vee (x_3 \wedge x_1)$ 2

(b) Find the output expression for the following gating network. 3



- (c) Express $A + BCD$ using NOR gates only. 2
- (d) Define modus ponens and modus tollens. 3
- (e) Write the following statements using predicate logic : 3
- (i) All women are beautiful.
 - (ii) All that glitters is not gold.
3. (a) Define the following with suitable examples :
Isomorphic graph, Subgraph, Spanning subgraph,
Spanning tree, Cut vertex. 5
- (b) A graph has the following adjacency matrix. Show
that it is connected. 5

$$\begin{bmatrix} 0 & 1 & 0 & 0 & 0 \\ 1 & 0 & 1 & 1 & 1 \\ 0 & 1 & 0 & 1 & 1 \\ 0 & 1 & 1 & 0 & 0 \\ 0 & 1 & 1 & 0 & 0 \end{bmatrix}$$

- (c) Use closet insertion algorithm to find the solution of
the following travelling salesman problem. 5

The distances are :

$$AB = 10$$

$$BC = 60$$

$$DC = 50$$

$$EC = 60$$

$$ED = 100$$

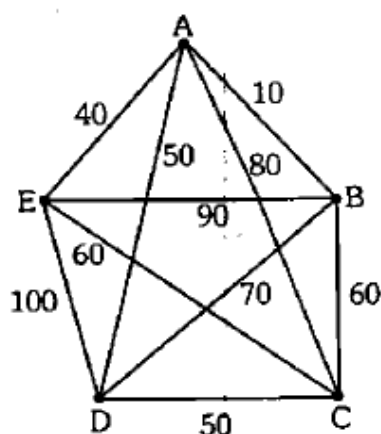
$$AE = 40$$

$$EB = 90$$

$$AC = 80$$

$$DB = 70$$

$$AD = 50$$



4. (a) Prove that $A \times (B \cap C) = (A \times B) \cap (A \times C)$. 3
- (b) Define equivalence relation with example. Prove that "If R is an equivalence relation then R^{-1} is also equivalence." 5
- (c) Define hashing function. 2
- (d) Define the following in the context of fuzzy sets : 3
- (i) α -cut
 - (ii) support
 - (iii) height
- (e) Find if the following functions are invertible : 2
- (i) $f_1(x) = x^2$
 - (ii) $f_2(x) = x + 1$
5. (a) Draw D_{105} lattice. (D_{105} represents the lattice formed by divisors of 105) 3
- (b) Define complemented lattice and distributive lattice. 3

- (c) Solve the following equation using Karnaugh map :
 $F(w, x, y, z) = \Sigma(0, 1, 2, 7, 8, 11, 13, 15)$ 4
- (d) Design a full adder using two half adders. Give the design of the half adder also. 5