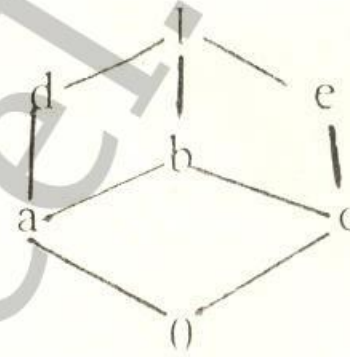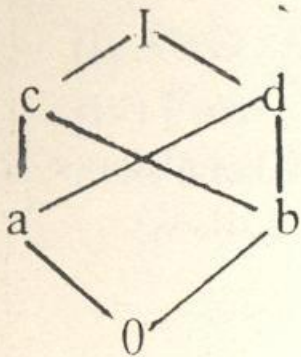Time: 3 Hours

Dated: 08-11-2007
Max. Marks: 80

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DISCRETE STRUCTURES – (MS-172)

INSTRUCTIONS: 1) Attempt Five Questions in all.
2) Select At Least Two Questions from each section.
3) All questions carry equal marks.
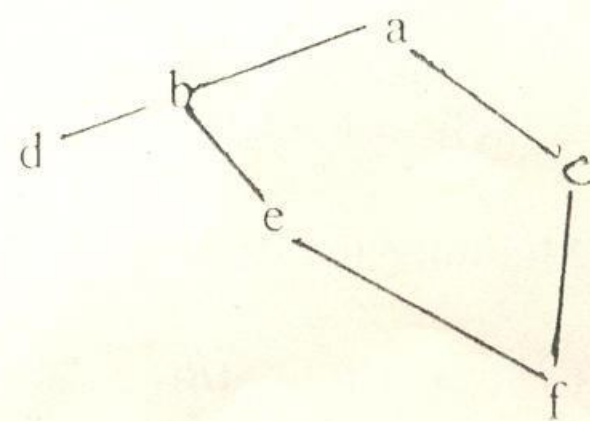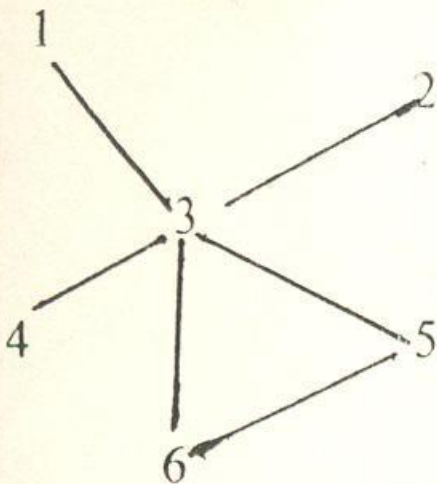
1. (a) Which of the following are lattices or not?   08

(b) Let A = {1,2,3,4,5,6} be ordered set as in figure below find maximal, minimal, first and last elements if exist.   08

2. (a) Let $m \varepsilon z^+ a,b,c,d \varepsilon z$ such that   08

$a \equiv b \pmod{m}$ & $c \equiv d \pmod{m}$

i) $a - c \equiv b - d \pmod{m}$

ii) $ac \equiv bd \pmod{m}$

iii) $ka \equiv kb \pmod{m}$

iv) If k a,k b & (k,m)=1., then $\dfrac{a}{k} \equiv \dfrac{b}{k} \pmod{m}$

(b) A person wants to buy substance A & B for Rs. 215. How many of each type can he buy if cost of A is 25 & cost of B is 45.   08

3. (a) Let $\approx$ is a relation defined on z as follows: 08

$x \approx y \Leftrightarrow x \equiv y \pmod 5$, show that $\approx$ is an equivalence relation also find distinct equivalence classes.

(b) If A is a set R is an equivalence relation defined on A, a & b are elements of A, then either $[a] = [b]$ or $[a] \cap [b]$.   08

4. (a) You are given valid argument. Derive the conclusion from the given premises.   08

$\sim p \rightarrow r \wedge \sim s$

$t \rightarrow s$ $p \vee q \rightarrow r$

$u \rightarrow \sim p$ $s \vee q$

$\sim w$ t

$u \vee w$ $p \rightarrow t$

$\therefore \sim t \vee w$ $p \wedge r \rightarrow s$

$\therefore \sim q$

(b) Suppose you visit the island & met two types of natives. Knight who always   08
tell the truth & Knaves who always tell lie. They talk to you as follows:

i) A says: B is knight.
B says: A & I are of opposite type.
Who are A&B?
ii) A says: Both of us are knight.
B says: A is a knave.
Who are A&B?

5. (a) Minimize the Boolean expression by the help of Boolean algebra.   08

i) $\bar{A}B\bar{C} + AB\bar{C} + \bar{A}BC + ABC = B$
ii) $\bar{A}\bar{B}\bar{C} + A\bar{B}\bar{C} + \bar{A}\bar{B}C + A\bar{B}C + ABC = \bar{B} + AC$

(b) Minimize the above expression by K-Map & its equivalent circuit diagram.   08

6. (a) How many new arguments can be made from the letters of word "FAVOUR"   04
So that vowel occupy at even place.

(b) How many three digit numbers greater than 330 can be formed from the digits   04
0, 1, 2, 3, 4, 5, 6.

(c) A bag contains six white, seven red and five black balls. Three balls are selected   04
at random. What is the probability that two are white?

(d) A die is loaded in such a way that an even number is twice as likely as an odd   04
number. If A is an event that a number less than 4 occur on a single toss of die.
Find P(A)?

7. Find the value of k if following serve as pdf: 16

$$(i) f(x) = \frac{3k}{2} xe \quad : \qquad x : [0. \quad)$$

$$(ii) f(x) = \frac{2k}{3^x} : \qquad x = 1,2,3,....$$

8. Define the following: 16

(i) AND Gate (ii) XOR Gate (iii) OR Gate
(iv) Poset (v) Lattice (vi) Onto Function
(vii) Maximal Element (viii) glb

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NED UNIVERSITY OF ENGINEERING & TECHNOLOGY, KARACHI
FIRST YEAR (COMPUTER SCIENCE AND INFORMATION TECHNOLOGY)
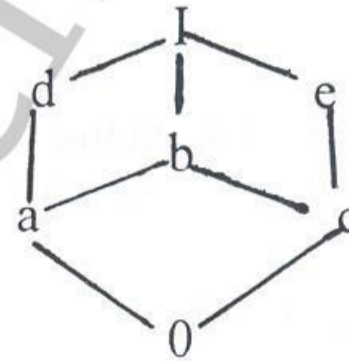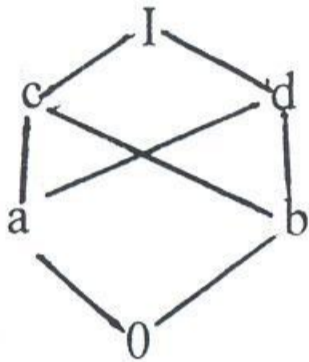## ANNUAL EXAMINATION 2007
FOR REPEATERS

Time: 3 Hours

DISCRETE MATHEMATICS – (MS-150)

INSTRUCTIONS: 1) Attempt Five Questions in all.
2) Select At Least Two Questions from each section.
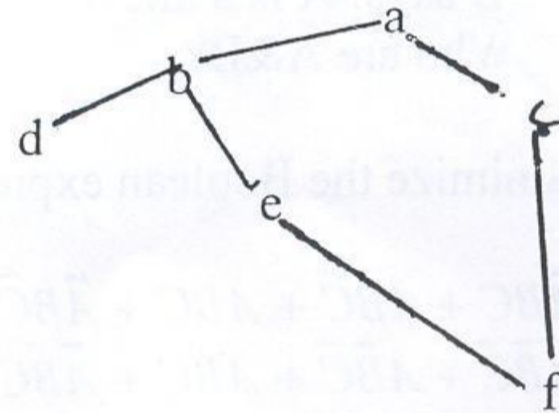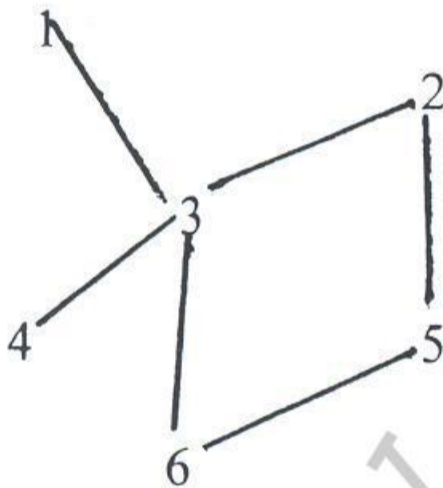3) All questions carry equal marks.

1. (a) Which of the following are lattices or not?　　　　08

(b) Let A = {1,2,3,4,5,6} be ordered set as in figure below find maximal, minimal,　08
first and last elements if exist.

2. (a) Let $m \varepsilon z^{+} a,b,c,d \varepsilon z$ such that　　08

$a \equiv b(\text{mod } m)$ 　　　&　　　$c \equiv d(\text{mod } m)$

i) $a - c \equiv b - d(\text{mod } m)$

ii) $ac \equiv bd(\text{mod } m)$

iii) $ka \equiv kb(\text{mod } m)$

iv) If k a,k b & (k,m)=1.,then $\dfrac{a}{k} \equiv \dfrac{b}{k}(\text{mod } m)$

(b) A person wants to buy substance A & B for Rs. 215. How many of each　08
type can he buy if cost of A is 25& cost of B is 45.

3. (a) Let $\approx$ is a relation defined on z as follows:　　08

$x \approx y \Leftrightarrow x \equiv y(\text{mod } 4)$, show that $\approx$ is an equivalence relation also find
distinct equivalence classes.

(b) If A is a set R is an equivalence relation defined on A, a & b are elements of A, then either [a]= [b] or[a]∩[b]   08

4. (a) You are given valid argument. Derive the conclusion from the given premises.   08

$\sim p \rightarrow r \wedge \sim s$

$t \rightarrow s$ $\sim p \vee q \rightarrow r$

$u \rightarrow \sim p$ $s \vee \sim q$

$\sim w$ $\sim t$

$u \vee w$ $p \rightarrow t$

$\therefore \sim t \vee w$ $\sim p \wedge r \rightarrow \sim s$

                                    $\therefore \sim q$

(b) Suppose you visit the island & met two types of natives. Knight who always tell the truth & Knaves who always tell lie. They talk to you as follows: 08

   i) A says: B is knight.
      B says: A & I are of opposite type.
      Who are A&B?
   ii) A says: Both of us are knight.
      B says: A is a knave.
      Who are A&B?

5. (a) Minimize the Boolean expression by the help of Boolean algebra.   08

$$i) \overline{A}BC + AB\overline{C} + ABC + \breve{A}B\overline{C} = B$$
$$ii) \widetilde{AB}\overline{C} + A\overline{B}\overline{C} + ABC + \overline{A}BC + A\overline{B}C = \overline{B} + AC$$

(b) Minimize the above expression by K-Map & its equivalent circuit diagram.   08

6. (a) How many new arguments can be made from the letters of word "FAVOUR" So that vowel occupy at even place.   04

(b) How many three digit numbers greater than 330 can be formed from the digits 0, 1, 2, 3, 4, 5, 6.   04

(c) A bag contains six white, seven red and five black balls. Three balls are selected at random. What is the probability that two are white?   04

(d) A die is loaded in such a way that an even number is twice as likely as an odd number. If A is an event that a number less than 4 occur on a single toss of die. Find P(A)?   04

7. Define the following: 16

    (i) AND Gate   (ii) NOR Gate   (iii) OR Gate
    (iv) Poset   (v) Finite State Machine   (vi) Lattice
    (vii) Mamal Element   (viii) *lub*

8. (a) Differentiate between Finite Automata and Transition Graph with examples.   08
   (b) Construct a finite State Machine from an alphabet $\sum = \{a, b\}$ which allows   08
       aab and *aba* only.

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