NED UNIVERSITY OF ENGINEERING & TECHNOLOGY, KARACHI
FIRST YEAR (COMPUTER SCIENCE AND INFORMATION TECHNOLOGY)
ANNUAL EXAMINATION 2008
BATCH 2007-08

Time: 3 Hours **Dated: 08-11-2008**

000146 **Max. Marks: 75/80**

DISCRETE STRUCTURES – (CT-162)

INSTRUCTIONS: Attempt FIVE questions in all. All questions carry equal marks.

Q1 (a) Out of 500 students, 320 of them take Discrete Structures, 140 take Programming and 64 of them takes both. Both courses have an examination tomorrow. Only students not taking an examination will go to the dinner tonight. (10/10)

i) How many students will be at the dinner?

ii) If out of 500 students, 180 are female, of whom 60 take Discrete Structures, 70 take Programming and 37 take both; How many male was at the dinner?

(b) Prove De Morgan law theoretically. (5/6)

Q2 (a) Prove that Inverse of an equivalence relation is an equivalence relation (4/4)

(b) Using the symbols S(x), I(x), and M(x) write statements that express the following (6/6)

i) All students are intelligent.

ii) Some intelligent students like music.

iii) Everyone who likes music is a stupid student.

(c) Convert the Boolean expression $xy+(x+y)z$ into canonical sum of the product form. (5/6)

Q3(a) Define tautology, contradiction and contingency. (5/6)
Determine whether $(\sim p \wedge (p \rightarrow q)) \rightarrow \sim q$ is a tautology?

(b) Find out whether the given compound propositions are logically equivalent or not. (5/5)
$(p \leftrightarrow q)$ and $(p \wedge q) \vee \sim (p \vee q)$.

(c) Construct circuit that produce the following output: $(x+y+z)(\bar{x}\,\bar{y}\,\bar{z})$ (5/5)

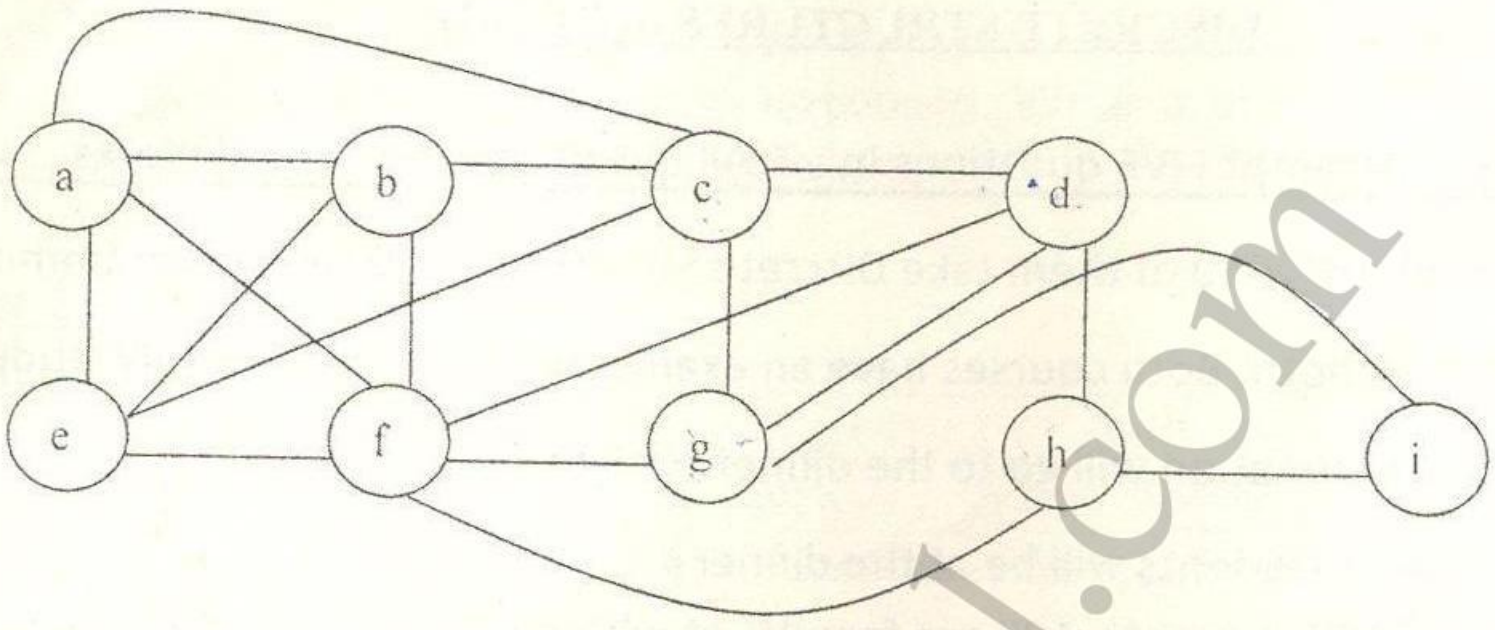
Q4(a) Differentiate the following (4/4)

i) Path and Circuit

ii) Euler path and Euler circuit

(b) Write the Algorithm of Euler circuit (5/6)

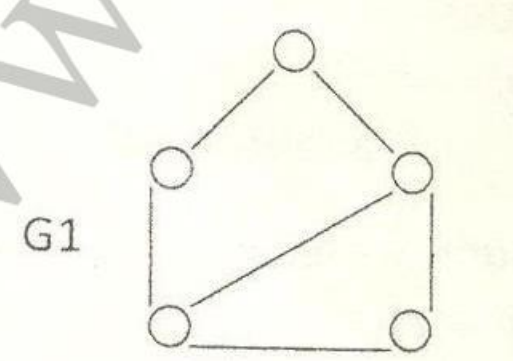
(c) Using Euler algorithm to construct Euler circuit of the given network. (6/6)

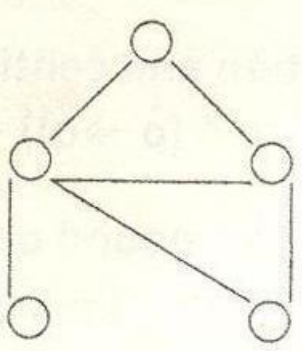


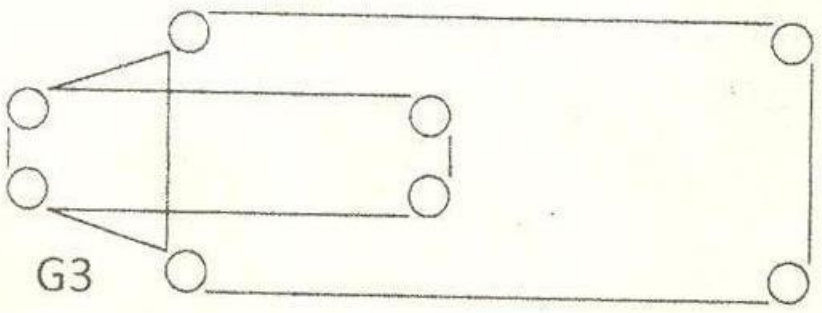
Q5(a) Define Bipartite graph and complete Bipartite graph. Is the given graph bipartite? If yes, redrawing to show bipartite? (6/6)

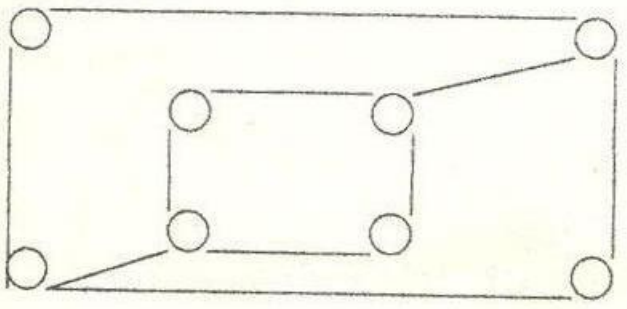
$$\begin{pmatrix} 1 & 0 & 1 & 0 & 1 & 0 & 1 & 0 \\ 0 & 1 & 0 & 1 & 0 & 1 & 0 & 1 \\ 1 & 0 & 1 & 0 & 1 & 0 & 1 & 0 \\ 0 & 1 & 0 & 1 & 0 & 1 & 0 & 1 \\ 1 & 0 & 1 & 0 & 1 & 0 & 1 & 0 \\ 0 & 1 & 0 & 1 & 0 & 1 & 0 & 1 \\ 1 & 0 & 1 & 0 & 1 & 0 & 1 & 0 \\ 0 & 1 & 0 & 1 & 0 & 1 & 0 & 1 \end{pmatrix}$$

(b) Are the following graphs isomorphic to each other? (4/4)







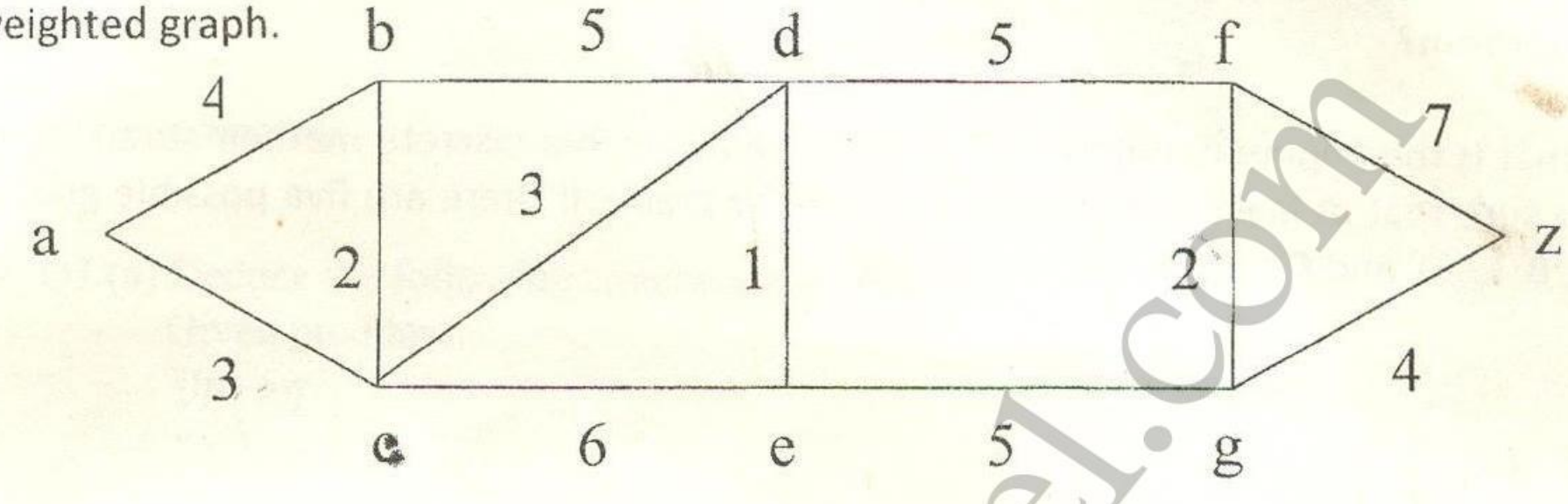


(c) Draw these graphs. (5/6)

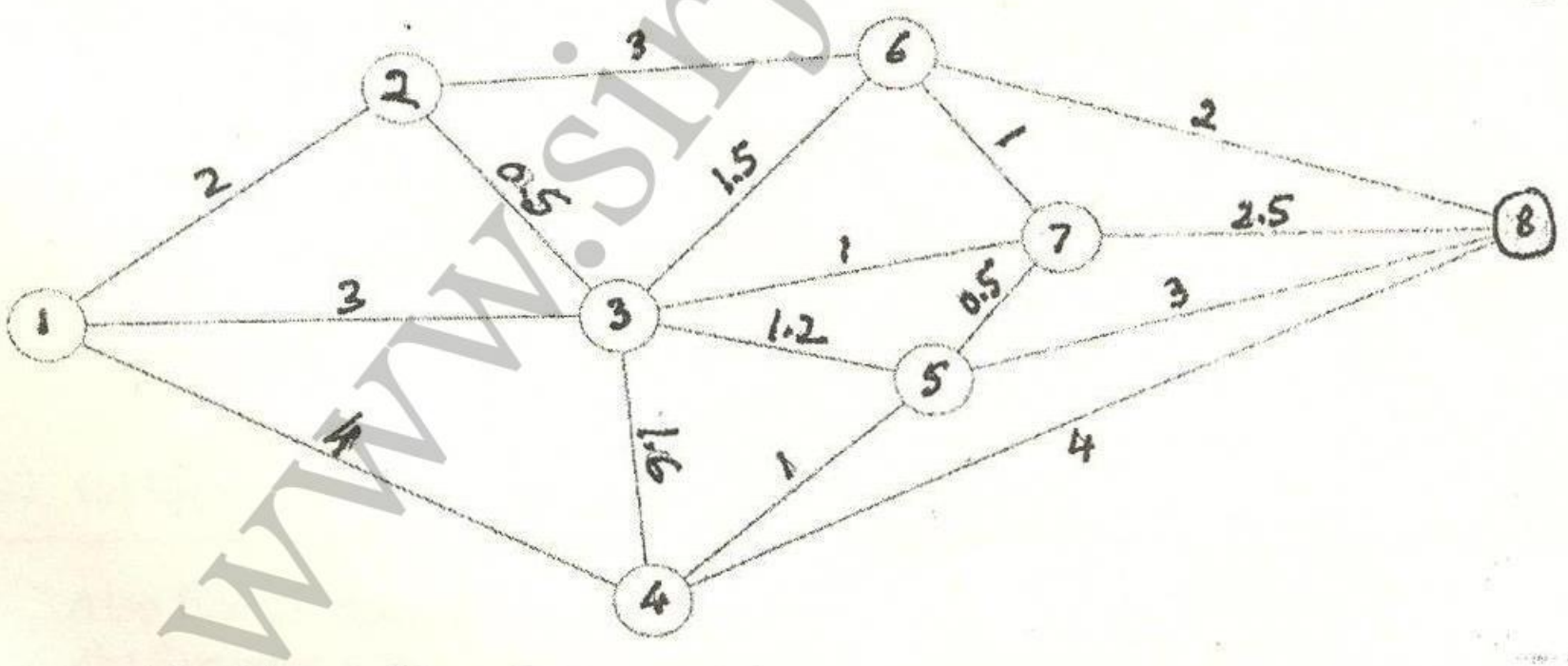
i) K_8 ii) $K_{1,8}$ iii) $K_{5,4}$

Q6(a) Write the Dijkstra's algorithm. Also differentiate between tree and spanning tree. (4/4)

(b) Find the length of the shortest path between the vertices **a** and **z** in the following weighted graph. (5/6)



(c) NED University is installing an electronic mail system. The following network shows the possible electronic connection among the offices. Distances between offices are shown in thousand of feet. Develop a design for the office communication system that will enable all offices to have access to the electronics mail service. Provide the design that minimizes the total length of connection among the eight offices. (6/6)



Q7(a) How many bit strings of length ten contain (5/6)

i) exactly four 1
ii) at most four 1
iii) at least four 1

(b) Suppose that we would like to design an office to each of our three system manager so, m_1, m_2, and m_3, if we have seven room available. How many ways are there to allocate rooms to the mangers? (5/5)

(c) A bit string of length four is generated at random so that each of the 16 bit string of length four is equally likely. What is the probability that it contains at least two consecutive 0s, given that its first bit is a 0? (5/5)

Q8(a) Represent each of these graphs with an adjacency matrix. (6/6)

i) K_4 ii) $K_{1,5}$ iii) $K_{2,3}$

(b) What is Algorithm, description of algorithm, types of algorithm, and complexity of algorithm? (5/5)

(c) What is the minimum number of students required in a discrete mathematics class to be sure that at least six will receive the same grade, if there are five possible grades, A, B, C , D, and E? (4/5)

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Time: 3 Hours **Dated: 08-11-2008**
Max. Marks: 80

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DISCRETE MATHEMATICS – (CT-172)

MS-150

INSTRUCTIONS: 1) Attempt Five Questions in all.
2) All questions carry equal marks.

Q1 (a) Deduce the following conclusion by using Given premises. 08

i) $p \to q$
$r \vee s$
$s \to t$
$q \vee s$
s
$p \wedge r \to u$
$w \vee t$
$\therefore u \wedge w$

ii) $p \to q$
$r \vee s$
$u \to v$
$r \to t$
$\sim q$
$s \to p$

(b) Consider two types of people knight who tell the truth & Knaves who always lie. You have the following information. 04
A says is knight
B says: A & I am of opposite type.
What are A & B.?

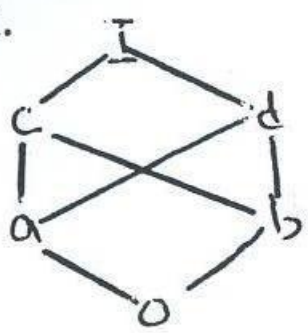
(c) Write negation for each of the following statements 04
(i)The bus was late or Tom s watch was slow.
(ii) $-1 < x \leq 4$

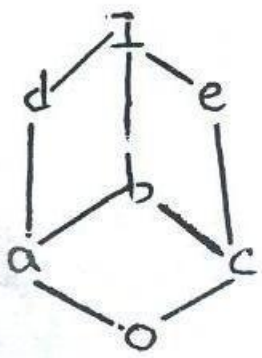
Q2 (a) show that following relation is equivalence 08
$x \equiv y (\mathrm{mod} 3)$
Also find all equivalence classes.

(b) Suppose A is a set, R is an equivalence relation on A, a & b are elements of A. then 08
either $[a] \wedge [b] = \Phi$ *or* $[a] = [b]$

Q3 (a) let L be a lattice, then 08
(i) $a \wedge b = a \Leftrightarrow a \vee b = b$
(ii) The relation $a \leq b$ is partial order on L.

(b) Check which of the following are lattices? If not explain the reason. 08

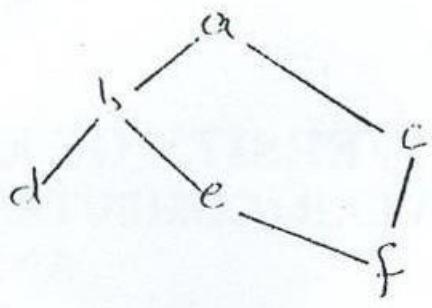




Q4 (a) Let L be a bounded distributive lattice, then compliments are unique if they exist. 04

P.T.O

(b) Let S = {a, b, c, d, e, f, g} be ordered as in figure. 04



Find:

a. the set of upper bounds of A.
b. find the set of lower bounds of A.
c. does sup(A) exist. ;here A={a,c,d}
d. does inf (A) exist.

(c) Let A is non empty set & R is an equivalence relation on A, then the distinct equivalence classes of R form a partition of A; i.e., the union of the equivalence classes is all of A & the intersections of any two distinct classes are empty. 08

Q5 (a) Minimize the following by the help of Boolean algebra 12
$\bar{A}\bar{B}\bar{C}\bar{D} + A\bar{B}\bar{C}D + \bar{A}B\bar{C}D + A\bar{B}C\bar{D}$
Verify it by K-map. Also draw its equivalent cct diagram.

(b) Convert 1234.58 into binary & octal system. 04

Q6 (a)A person wants to buy apples & oranges, for Rs.25. how many fruits of each type can he buy if apple cost Rs.4/each & orange cost Rs.3/each. 08

*(b)*let $m, m_1, m_2 \in N, a,b,c,d \in Z$ *then prove that* 08

(i)if $a \equiv b(mod\ m),\ c \equiv d(mod\ m)$ *then* $ac \equiv bd(mod\ m)$

(ii) $a \equiv b(mod\ m_1) \& a \equiv b(mod\ m_2) \Leftrightarrow a \equiv b(mod\ m)$

where $m = \dfrac{|m_1 m_2|}{< m_1, m_2 >}$

(iii) if $a \equiv b(mod\ m) \&\ c$ *is such that* $c \mid a,\ c \mid b \ \&(c, m) = d$ *then*

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

Q7 (a) Prove by the help of mathematical induction. 08

$$\sum_{i=1}^{n} \frac{1}{i(i+2)} = \frac{3}{4} - \frac{2n+3}{2(n+1)(n+2)}$$

(b) Let *a, b* be integers which are not both zero, & let *c be a* positive integer then 08

(i)$(ac, bc)=c(a,b)$

(ii) $c \mid a,\ c \mid b$ *then* $(\dfrac{a}{c}, \dfrac{b}{c}) = \dfrac{(a,b)}{c}$

(iii)*if* $d=(a,b)$ *then* $(\dfrac{a}{d}, \dfrac{b}{d}) = 1$

Q8 If coin is tossing three times. Find the following probabilities 16

(i) Two head appears
(ii) At least one head appear
(iii)At most two heads appear
(iv)No head appear