NED UNIVERSITY OF ENGINEERING AND TECHNOLOGY, KARACHI

MASTER OF COMPUTER SCIENCE & INFORMATION TECHNOLOGY SPRING SEMESTER EXAMINATION -2008

Dated: 19-05-2008

Time: 3 Hours **Max Marks: 70**

OPERATION RESEARCH & OPTIMIZATION

(CT-503)

Instructions: 1. Solve any FIVE questions. All questions carry equal marks.
2. Complete and systematic presentation of your work shall attract more marks.

Q-1.(a). Minimize: $Z = 5X_1 + 7X_2 + 9X_3$ 10

Subject to constraints

$$2X_1 - 3X_2 + X_3 \geq 15$$
$$3X_1 + 4X_2 - 7X_3 \geq 20$$
$$4X_1 + X_2 + 6X_3 \geq 25$$
$$X_1, X_2, X_3 \geq 0$$

(b). Prove or disprove that the set: $A=\{ (x, y) \mid 4x + 5y \leq 20 \}$ is a convex set. 04

Q-2. A Company produce TV picture tubes at three plants. Plant 1 can produce up to 50 tubes per week. Plant 2 can produce up to 100 tubes per week, and plant 3 can produce 50 tubes per week. Tubes are shipped to four customers. The profit earned per tubes depends on the site where the tubes was produced and on the customer who purchases the tube, given below in table. Customer 1 is willing to purchase up to 70 tubes per week. Customer 2 , up to 60 tubes per week, Customer 3, up to 40 tubes per week and Customer 4,up to 30 tubes per week .Company wants to find a shipping and production plan that will maximize profits.

From	To			
	Customer 1	customer 2	customer 3	customer 4
Plant 1	Rs.75	Rs.60	Rs.69	Rs.80
Plant 2	Rs.79	Rs.73	Rs.68	Rs.70
Plant 3	Rs.85	Rs.76	Rs.70	Rs.65

(a). Formulate the mathematical model of balanced transportation problem that can be uses to maximize profit. Define clearly various equations. 05

(b). Solve the problem in order to minimize the cost by Least cost method or Vogel's approximation method. 09

Q-3.(a) Solve the following Assignment problem in order to minimize the cost by Hungarian Met

	M-1	M-2	M-3	M-4	M-5
J-1	15	11	11	15	8
J-2	11	21	13	16	16
J-3	12	18	11	22	12
J-4	13	15	11	21	16
J-5	11	11	30	11	16

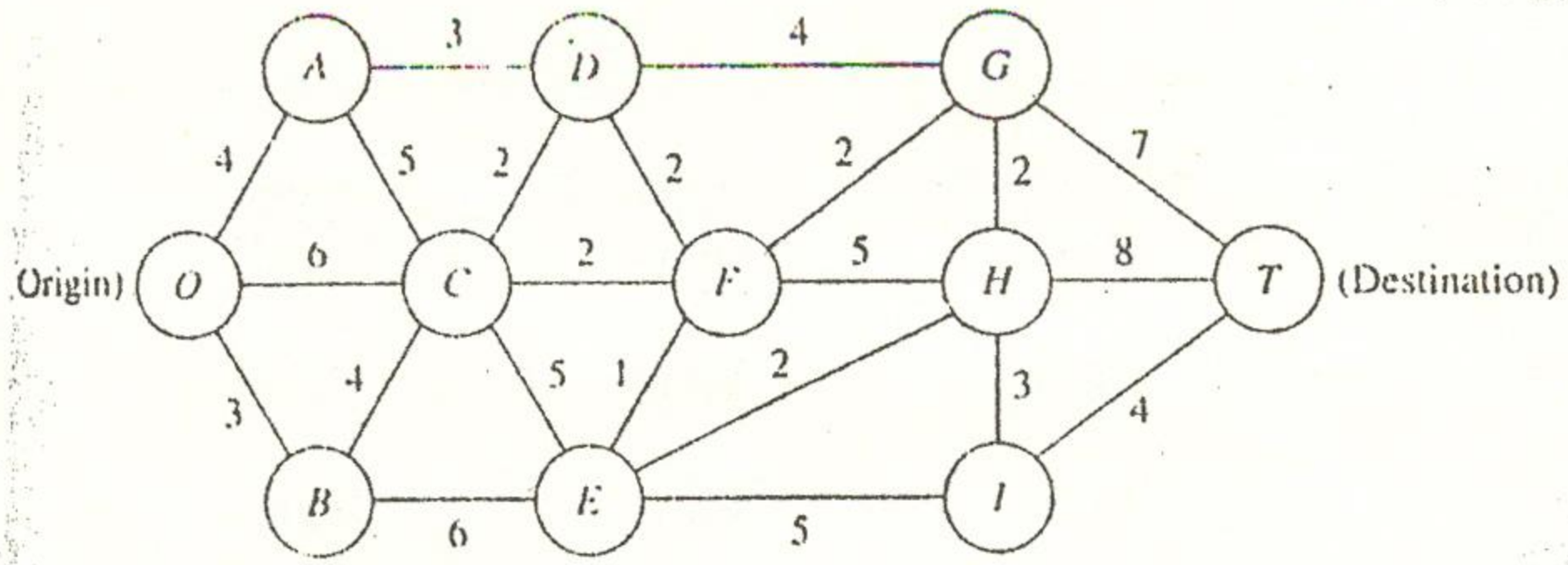
Where" J" stands for Job and "M" stand for Machine

(b).

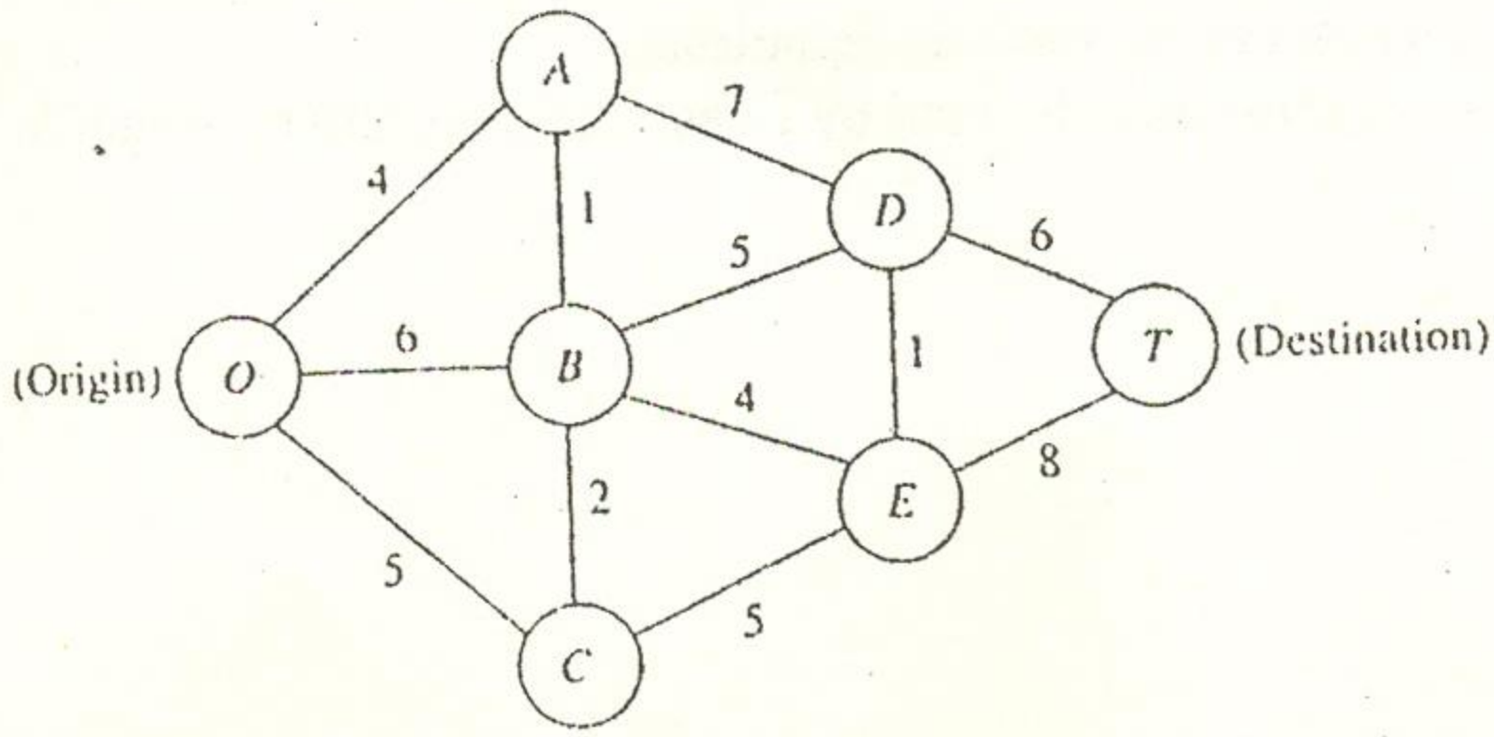
With above notation , maximize the Total Cost of Job Allocation in the following Assignment problem.

	M-1	M-2	M-3	M-4
J-1	10	9	8	5
J-2	5	19	10	7
J-3	6	5	6	9
J-4	7	8	11	4

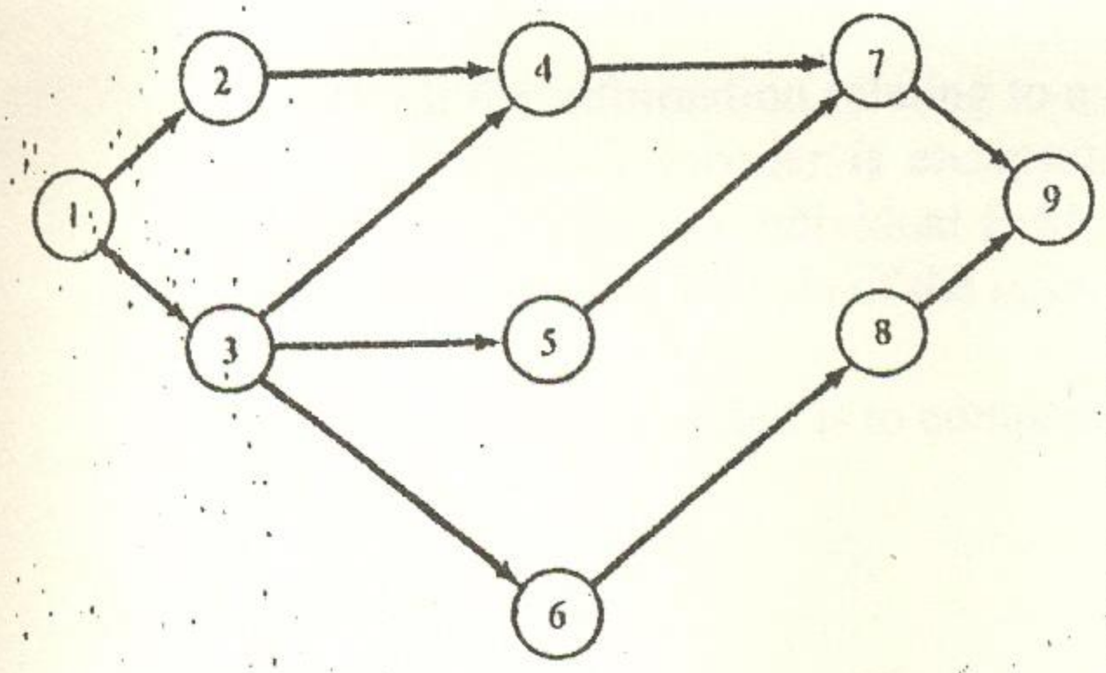
Q-4.(a). Find the shortest spanning tree using kruskal Greedy algorithm, showing the steps of following network model.



(b). Using the Djkstra's algorithm, showing steps of algorithm to find the shortest path fo following network model.



Q-5. Consider the project network in following figure. For each activity, you are given the estimates of a , b and m in the table. Determine the critical path for this network. And find the probability that project is completed within 50 days. 14



Activity	a	b	m
(1,2)	4	8	6
(1,3)	2	8	4
(2,4)	1	7	3
(3,4)	6	12	9
(3,5)	5	15	10
(3,6)	7	18	12
(4,7)	5	12	9
(5,7)	1	3	2
(6,8)	2	6	3
(7,9)	10	20	15
(8,9)	6	11	9

Q-6.(a). Find the value of game and optimal strategies of two person zero-sum game, whose pay off matrix is given below. 05

$$A = \begin{bmatrix} 2 & 3 & 4 & 2 \\ 5 & 6 & 4 & 6 \\ -2 & -1 & 4 & -2 \\ 2 & 4 & 1 & 3 \end{bmatrix}$$

(b). Use principle of dominance or by the method of linear programming, solve the following Game matrix. 09

$$\begin{bmatrix} -3 & 1 & 3 \\ 1 & -2 & 2 \\ 2 & -1 & 3 \end{bmatrix}$$