

**NED UNIVERSITY OF ENGINEERING AND TECHNOLOGY, KARACHI**  
**MASTER OF COMPUTER SCIENCE AND INFORMATION TECHNOLOGY**  
**FALL SEMESTER EXAMINATION -2007**  
**(FOR I-GRADE)**

Dated: 13-12-2007

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.

- 1 (a). With reference to linear programming problems explain the following terms. 05
- |                        |                          |                                |
|------------------------|--------------------------|--------------------------------|
| (i). Constraints       | (ii). Objective function | (iii). Basic feasible solution |
| (iv). Optimal solution | (v). Convex set.         |                                |

- (b). Write down the "dual Problem" of the following and then solve by the Simplex Method. 09
- Minimize:  $Z = 5 X_1 + 7 X_2 + 9 X_3$   
 Subject to constraints

$$\begin{aligned} 2 X_1 - 3 X_2 + X_3 &\geq 15 \\ 3 X_1 + 4 X_2 - 7 X_3 &\geq 20 \\ 4 X_1 + X_2 + 6 X_3 &\geq 25 \\ X_1, X_2, X_3 &\geq 0 \end{aligned}$$

- 2 (a). With the reference of Game theory, explain the following terms.
- |                                |                              |
|--------------------------------|------------------------------|
| (i). Two-person -Zero sum game | (ii). Saddle point           |
| (iii). Pay -off a game         | (iii). Value of a game       |
|                                | (iv). Principle of Dominance |

- (b). Solve the Matrix game with pay-off

$$\begin{bmatrix} 2 & -4 & 1 \\ 3 & 2 & -3 \end{bmatrix}$$

and determine whether the game is favorable to any player

- 3 Powerco has three Electric power plant that supply the power needs of four cities .Each power plant can supply following number of kilowatt hour(Kwh) of electricity
- Plant 1, 35 million Kwh .  
 Plant 2, 50 million Kwh  
 Plant 3 , 40 million Kwh.
- The peak power demands in these cities which occurs at the same time (2.P.M) are follows,
- City 1, 45 million Kwh  
 City 2, 20 million Kwh  
 City 3, 30 million Kkw  
 City 4, 30 million Kwh
- The costs of sending one million Kwh electricity from plant to city depends on the distance  
 The electricity must travel (Given as in table)

	TO				
FROM	CITY 1	CITY 2	CITY 3	CITY 4	SUPPLY
PLANT 1	\$ 8	\$ 6	\$ 10	\$ 9	35
PLANT 2	\$ 9	\$ 12	\$ 13	\$ 7	50
PLANT 3	\$ 14	\$ 9	\$ 16	\$ 16	40
DEMAND	45	20	16	30	

- (a). Formulate the mathematical model of balanced transportation problem that can be used to minimize the cost of meeting each city's peak power demand.
- (b). Use the Northwest Corner method or Least Cost Method to find a bfs to the problem and improve it.

**OR**

Solve the problem in order to minimize the cost by Vogel's Approximation Method.

- Q-4** (a). Solve the following Assignment problem in order to minimize the cost by Hungarian Method

	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

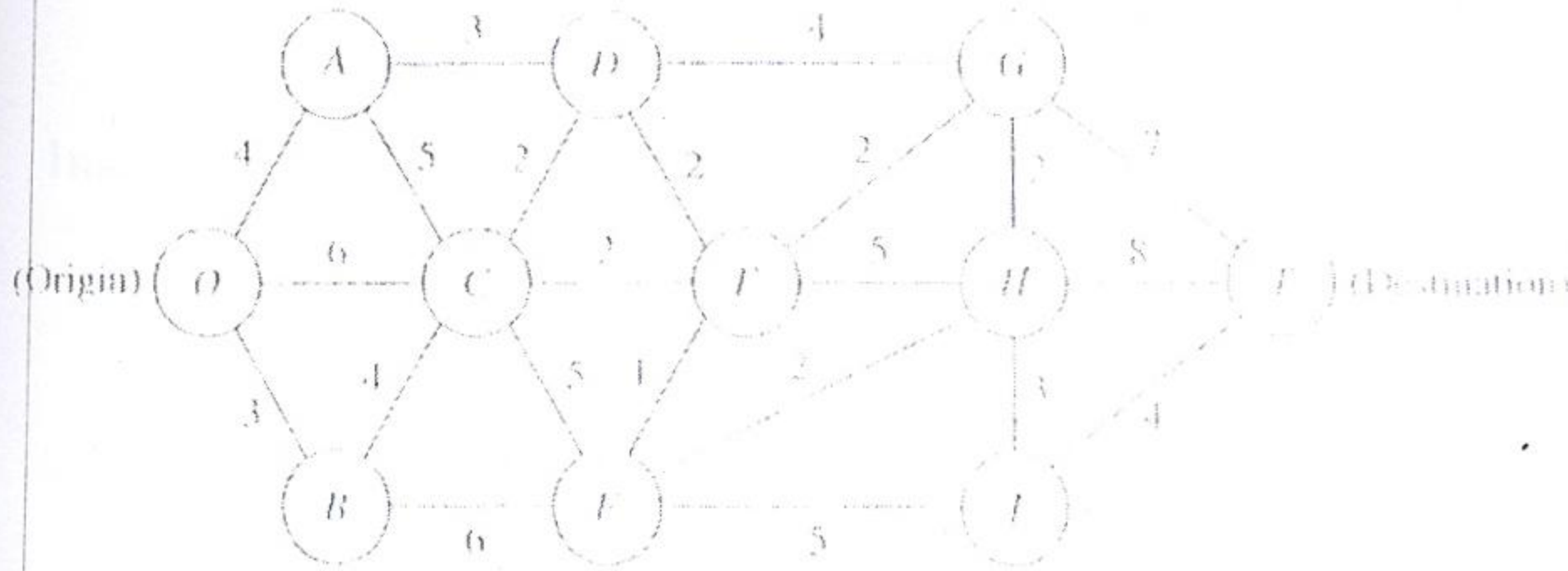
Where "J" stands for Job and "M" stand for Machine

- (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

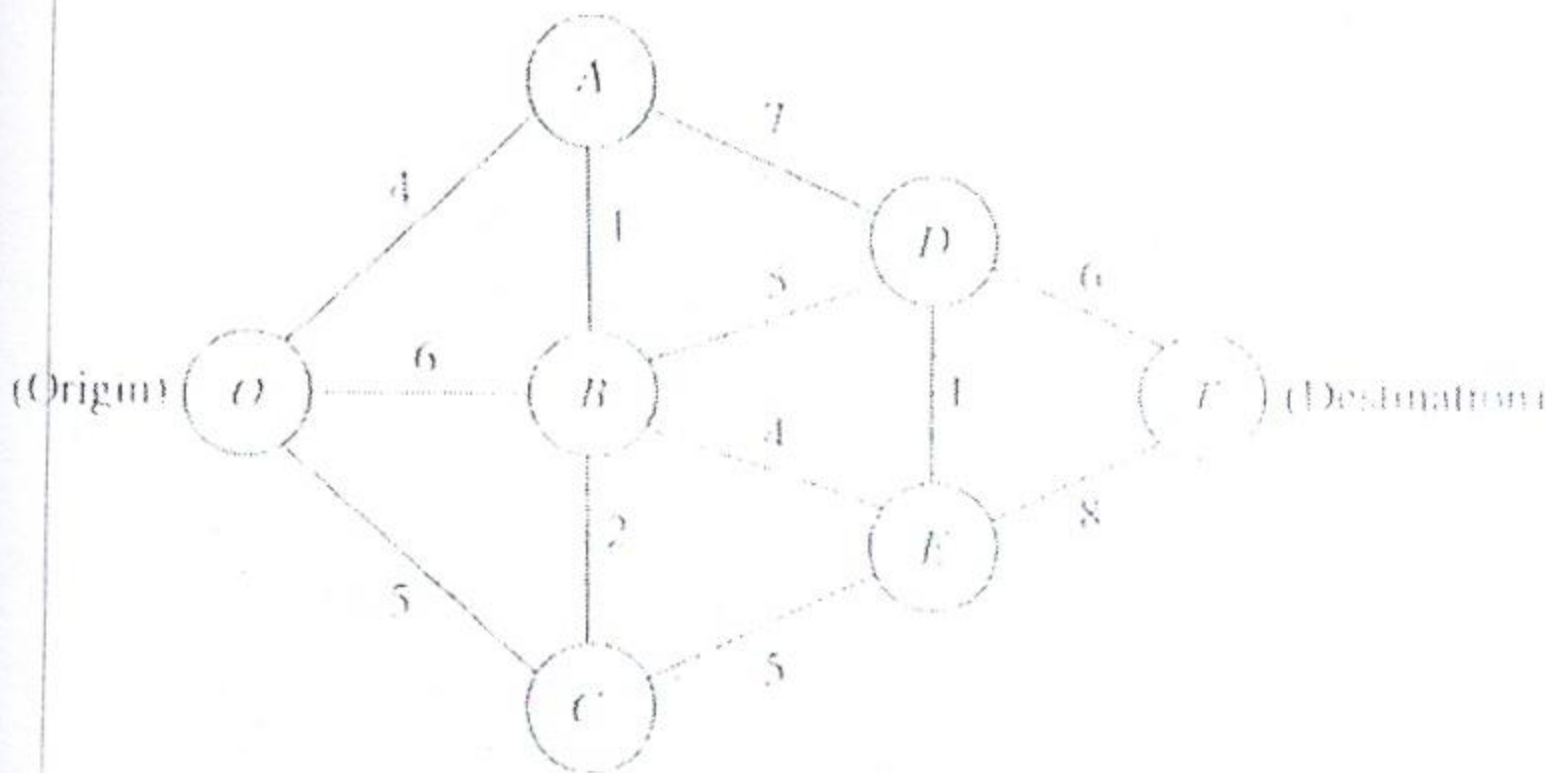
(a). Find the shortest spanning tree using Kruskal Greedy algorithm, showing the steps of following network model.

07



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

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Consider the list of activities and predecessors that are involved in building a house:

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ACTIVITIES	DESCRIPTION	PREDECESSORS	DURATION (Days)
A	Build foundation	-----	5
B	Build walls and ceilings	A	8
C	Build roof	B	10
D	Do electrical wiring	B	5
E	Put in windows	B	4
F	Put on siding	E	6
G	Paint house	C, F	3

Draw a project network. Use Critical Path Method (CPM) to determine the length of time required to complete this project.