LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

B.Sc. DEGREE EXAMINATION – **MATHEMATICS**

FIFTH SEMESTER – **APRIL 2013**

MT 5507/MT 5504 - OPERATIONS RESEARCH

Date: 11/05/2013 Dept. No. Max. : 100 Marks

Time: 9:00 - 12:00

PART - A

ANSWER **ALL** QUESTIONS: (10x2=20)

1. Define surplus variables.
2. Define a optimum basic feasible solution.
3. What is a transportation problem?
4. Give the mathematical formulation of an assignment problem.
5. Define payoff matrix.
6. Define saddle point.
7. Define a dummy activity.
8. State any two rules to be followed while constructing a network.
9. Define the following terms i) Lead time ii) Planning Horizon.
10. What is Economic Order Quantity?

PART - B

ANSWER ANY **FIVE** QUESTIONS: (5x8=40)

11. Use the graphical method to solve the following LP problem.

$$\text{Maximize } Z = 3x_1 + 2x_2$$
$$\text{Subject to} -2x_1 + x_2 \le 1$$
$$x_1 \le 2$$
$$x_1 + x_2 \le \text{ and } x_1, x_2 \ge 0$$

12. Use dual simplex method to solve the LP problem
Minimize $3x_1 + x_2$ subject to the constraints

$x_1 + x_2 \ge 1$

$2x_1 + 3x_2 \ge 2$ *and*

$x_1, x_2 \ge 0.$

13. A department has five employees with five jobs to be performed. The time (in hours) each man will take to perform each job is given in the effectiveness matrix.

		Employees				
		I	*II*	*III*	*IV*	*V*
	A	10	5	13	15	16
	B	3	9	18	13	6
Jobs	*C*	10	7	2	2	2
	D	7	11	9	7	12
	E	7	9	10	4	12

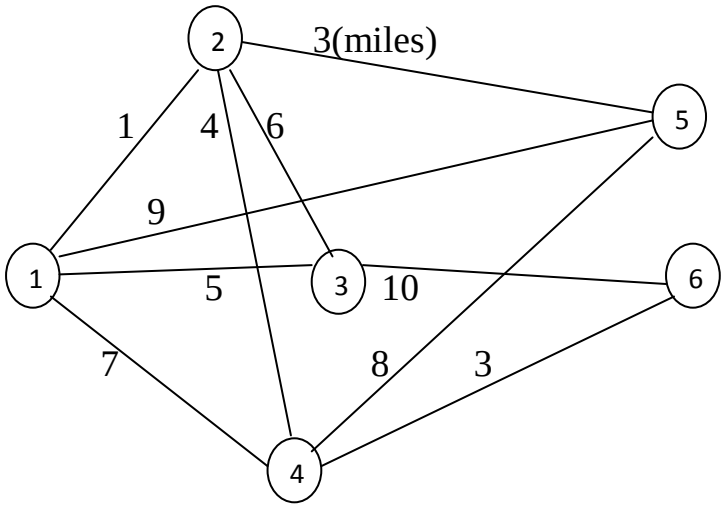
How should the jobs be allocated, one per employee, so as to minimize the total man – hours?

14. Use graphical method in solving the following game and find the value of the game.

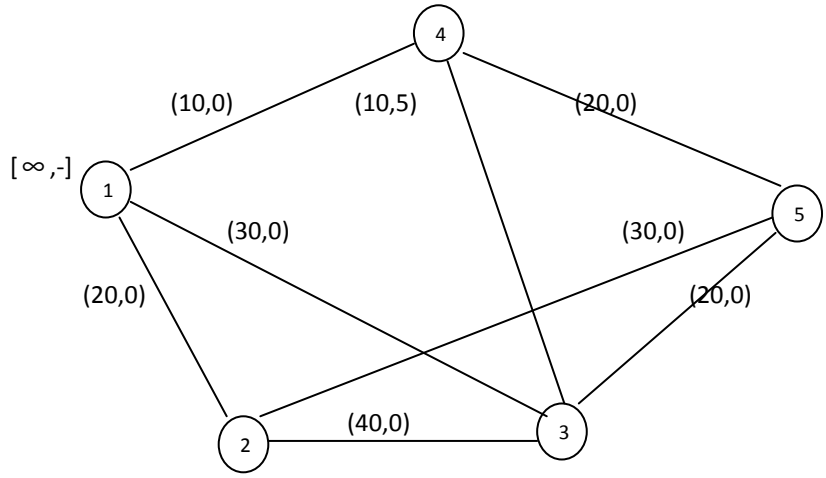
		Player B			
		B_1	B_2	B_3	B_4
Player A	A_1	2	2	3	-2
	A_2	4	3	2	6

15. In a game of matching coins with two players, suppose A wins one unit of value when there are two heads, wins nothing when there are two tails and losses ½ unit of value when there is one head and one tail. Determine the payoff matrix, the best strategies for each player and the value of the game.

16. A Television cable company is in the process of providing cable service to five new housing development areas. The following figure depicts the potential TV linkages among the five areas. The cable miles are shown on each branch. Determine the most economical cable network.



17. Determine the maximal flow in the following network.



18. The annual demand of a product is 10,000 units. Each unit costs Rs 100 if orders placed in quantities below 200 units but for orders of 200 or above the price is Rs 95. The annual inventory holding costs is 10 per cent of the value of the item and the ordering cost is Rs 5 per order. Find the economic lot size.(**4+4)**

PART - C

ANSWER ANY **TWO** QUESTIONS: (2 x 20 = 40)

19. Use the simplex method to solve the following LP problem.

Maximize $Z = 3x_1 + 5x_2 + 4x_3$ subject to the constraints

$2x_1 + 3x_2 \le 8$

$2x_2 + 5x_3 \le 10$

$3x_1 + 2x_2 + 4x_3 \le 15$

$x_1, x_2, x_3 \ge 0.$

20. Find the optimal solution for the following transportation problem using MODI method.

	D_1	D_2	D_3	D_4	Supply
S_1	19	30	50	10	7
S_2	70	30	40	60	9
S_3	40	8	70	20	18
Demand	5	8	7	14	34

(**10+10)**

21. a) The daily milk production (in million litres) at each plant of a dairy firm having three plants P_1, P_2 and P_3 are 6, 1 and 10 respectively. The firm must fulfil the needs of its four distribution centres. The minimum requirements at each centre (in million litres) are 7, 5, 3 and 2 respectively. The cost of shipping one million litres from each plant to each distribution centre is given in the following table in hundreds of rupees:

		Distribution centre			
		D_1	D_2	D_3	D_4
	P_1	2	3	11	7
Plant	P_2	1	0	6	1
	P_3	5	8	15	9

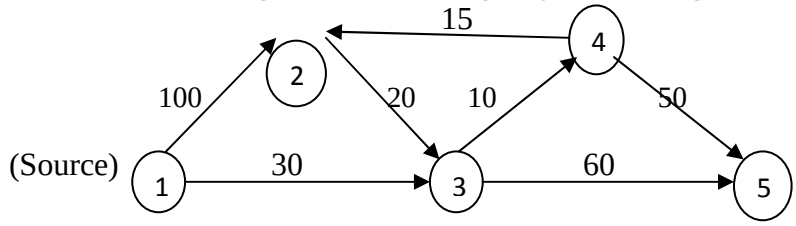
Find its initial basic feasible solution by i) Least cost method ii) Vogel's Approximation method.

b) Solve the game whose payoff matrix is given below by the principles of dominance:

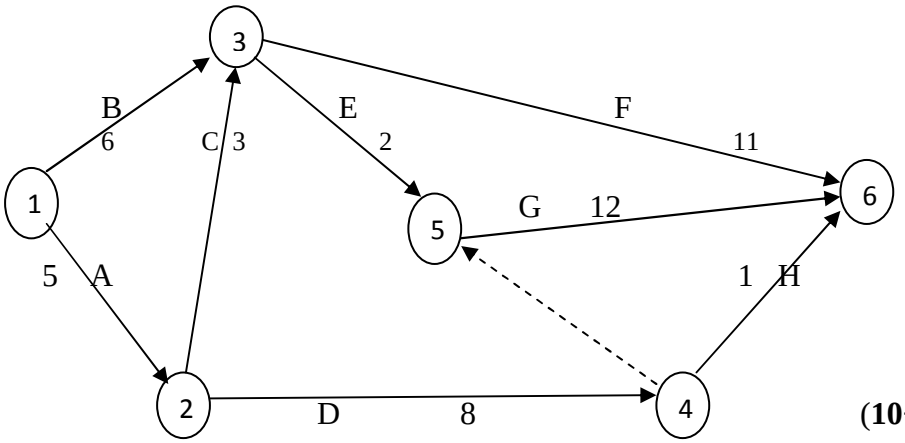
		Player B			
		B_1	B_2	B_3	B_4
	A_1	3	2	4	0
	A_2	3	4	2	4
Player A	A_3	4	2	4	0
	A_4	0	4	0	8

(10+10)

22. a) Determine the shortest routes between the source node and every other node in the following network using Dijkstra's algorithm



b) b) Determine the critical path and compute the floats for the noncritical activities of the project network given below:



(10+10)

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