LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

B.Sc. DEGREE EXAMINATION – MATHEMATICS

FIFTH SEMESTER – NOVEMBER 2014

MT 5507/MT 5504 - OPERATIONS RESEARCH

Date : 01/11/2014 Dept. No. Max. : 100 Marks

Time : 09:00-12:00

PART – A

Answer ALL the questions: **(10 x 2 = 20 Marks)**

1. State any two applications oflinear programming problem.
2. Define slack and surplus variables in a linear programming problem.
3. What is meant by unbalanced transportation problem?
4. Define an assignment problem.
5. What is the maxmin principle in game theory?
6. Define a pure strategy in game theory.
7. Define a path, cycle and tree in a network.
8. Define critical path in a network.
9. Explain setup cost and holding cost in an inventory.
10. Differentiate the deterministic and the probabilistic demand inventory models.

PART – B

Answer any FIVE questions: **(5 x 8 = 40 Marks)**

11. Use the graphical method to solve the following LPP.

Maximize $z = 21x_1 + 15x_2$

Subject to $x_1 + 2x_2 \leq 6$

$4x_1 + 3x_2 \leq 12$

$x_1 , x_2 \geq 0$

12. Solve the following LPP by dual simplex method.

Maximize $z = -3x_1 - x_2$

Subject to $x_1 + x_2 \geq 1$

$2x_1 + 3x_2 \geq 2$

$x_1 , x_2 \geq 0$

13. Determine an initial basic feasible solution to the following transportation problem by Matrix MinimaMethod(Least cost method).

	D1	D2	D3	D4	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

14. Solve the following assignment problemwhich minimizes the total of the project cost. Each contractor has to be assigned a job.

Contractors	Jobs			
	J_1	J_2	J_3	J_4
C_1	15	27	35	20
C_2	21	29	33	17
C_3	17	25	37	15
C_4	14	31	39	21

15. Solve the following game using the principle of dominance.

$$\begin{array}{cc} & \text{Player B} \\ \text{Player A} & \begin{bmatrix} 12 & 1 & 30 & -10 \\ 20 & 3 & 10 & 5 \\ -5 & -2 & 25 & 0 \\ 15 & -4 & 10 & 6 \end{bmatrix} \end{array}$$

16. Determine the critical path and the duration of the following network.

Activity	1-2	1-6	2-3	2-4	3-5	4-5	6-7	5-8	7-8
Duration	8	7	16	5	10	7	11	9	20

17. A project consists of a series of tables labeled A, B, …, H, I with the following relationships (W < X, Y means X&Y cannot start until W is completed; X, Y < W means W cannot start until both X&Y are completed). With this notations construct the network diagram having the following constraints: A < D, E; B, D < F; C < G; B < H; F, G < I

18. A particular item has a demand of quantity 9000 units/year. The cost of the one procurement is Rs.100 and the holding cost per unit is Rs.2.40 per year. The replacement is instantaneous and no shortages are allowed. Determine

(i) the economic lot size

(ii) the number of orders per year

(iii) the time between orders

PART – C

Answer any TWO questions: **(2 x 20 = 40 Marks)**

19. Use the Big-M method to solve the following LPP. (20)

Minimize $z = 5x_1 + 3x_2$

Subject to $2x_1 + 4x_2 \leq 12$

$2x_1 + 2x_2 = 10$

$5x_1 + 2x_2 \geq 10$

$x_1,\ x_2 \geq 0$

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

$$\begin{array}{cc} & \begin{array}{cccc} D & E & F & G \end{array} \quad \text{Supply} \\ \begin{array}{c} A \\ B \\ C \end{array} & \begin{bmatrix} 21 & 16 & 25 & 13 \\ 17 & 18 & 14 & 23 \\ 32 & 27 & 18 & 41 \end{bmatrix} \begin{array}{c} 11 \\ 13 \\ 19 \end{array} \\ \text{Demand} & \begin{array}{cccc} 6 & 10 & 12 & 15 \end{array} \end{array}$$

21. a) The following indicates the details of the activities of a project.
The durations are in days. (10)

Activities	T_O	T_M	T_P
1 – 2	4	5	6
1 – 3	8	9	11
1 – 4	6	8	12
2 – 4	2	4	6
2 – 5	3	4	6
3 – 4	2	3	4
4 – 5	3	5	8

(i) Draw the network

(ii) Find the critical path

(iii) Find the mean and standard deviation of the project completion time.

b) Reduce the following game to 2x2 game and hence find the value of the game. (10)

Player B

Player A		I	II	III	IV
	I	3	2	4	0
	II	3	4	2	4
	III	4	2	4	0
	IV	0	4	0	8

22. a) 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 percent of the value of the item and the ordering cost is Rs.5 per order. Find the economic lot size. (14)

b) If the annual demand is Rs. 600 units, the storage cost is Re. 0.60 per year unit and the set up cost is Rs. 80 per run, find the optimum run size. (6)

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