LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

B.Sc. DEGREE EXAMINATION – **ECONOMICS**

THIRD SEMESTER – NOVEMBER 2011

ST 3103/3100 - RESOURCE MANAGEMENT TECHNIQUES

Date : 09-11-2011 Dept. No. Max. : 100 Marks
Time : 9:00 - 12:00

SECTION - A

Answer ALL questions. Each carries TWO marks. (10 x 2 = 20 marks)

1. In a General Linear Programming Problem, define the following terms:
   (i) objective function (ii) constraints.
2. Explain the following terms used in the general LPP:
   (i) feasible solution (ii) optimum solution.
3. Explain slack and surplus variables.
4. Formulate a Transportation Problem as a LPP.
5. Present the Transportation Table for an m-origin, n-destination Transportation Problem and write its rim requirements.
6. Define a LOOP in a transportation table.
7. Give an example of an assignment problem.
8. Explain the following terms used in sequencing:
   (i) total elapsed time (ii) No passing rule.
9. Explain the following terms used in a PERT network:
   (i) optimistic time (ii) pessimistic time (iii) most likely time.
10. What are (i) set-up cost and (ii) ordering cost associated with inventories?

SECTION – B

Answer any FIVE questions. Each carries EIGHT marks. (5 x 8 = 40 marks)

11. A firm manufactures 3 products A, B, and C. The profit per unit sold of each product is Rs.3, Rs. 2, and Rs. 4 respectively. The time required to manufacture one unit of each of the three products and the daily capacity of the two machines P and Q is given in the table below:

Machine	Time per unit (minutes) Product			Machine capacity (minutes / day)
	A	B	C	
P	4	3	5	2,000
Q	2	2	4	2,500

It is required to determine the daily number of units to be manufactured for each product, so as to maximize the profit. However at least 100 A’s, 200 B’s, and 50 C’s , but no more than 150 A’s. Assume that all the units produced are consumed in the market. Formulate this problem as a LPP.

12. Solve the following LPP by graphical method:

Minimize $z = 2x_1 + x_2$

subject to the constraints:

$$5x_1 + 10x_2 \leq 50$$
$$x_1 + x_2 \geq 1$$
$$x_2 \leq 4$$
$$x_1, x_2 \geq 0.$$

13. Find all the basic solutions to the system of linear equations :

$$x_1 + 2x_2 + x_3 = 4$$
$$2x_1 + x_2 + 5x_3 = 5.$$

Are the solutions degenerate?

14. Use simplex method to solve the following LPP:

Maximize $z = 107x_1 + x_2 + 2x_3$

subject to the constraints:

$$14x_1 + x_2 - 6x_3 + 3x_4 = 7$$
$$16x_1 + \frac{1}{2}x_2 - 6x_3 \leq 5$$
$$3x_1 - x_2 - x_3 \leq 0$$
$$x_1, x_2, x_3, x_4 \geq 0.$$

15. Determine an initial feasible solution to the following transportation problem using the North-West Corner Rule:

Origin	Destination				Available
	D_1	D_2	D_3	D_4	
O_1	6	4	1	5	14
O_2	8	9	2	7	16
O_3	4	3	6	2	5
Requirement	6	10	15	4	35

16. Consider the problem of assigning five jobs to five persons. The assignment costs are given as follows:

Persons	Job				
	1	2	3	4	5
A	8	4	2	6	1
B	0	9	5	5	4
C	3	8	9	2	6
D	4	3	1	0	3
E	9	5	8	9	5

Determine the optimum assignment schedule.

17. In a factory, there are six jobs to perform, each of which should go through two machines A and B, in the order A, B. The processing timings (in hours) for the jobs are given here. Determine the sequence for performing the jobs that would minimize the total elapsed time, T. What is the value of T?

Job :	J_1	J_2	J_3	J_4	J_5	J_6
Machine A :	1	3	8	5	6	3
Machine B :	5	6	3	2	2	10

18. A project consists of seven activities for which relevant data are given below:

Activity	Preceding Activities	Activity Duration (Days)
A	--	4
B	--	7
C	--	6
D	A, B	5
E	A, B	7
F	C, D, E	6
G	C, D, E	5

Draw the network and find the project completion time.

SECTION – C

Answer any TWO questions. Each carries TWENTY marks. (2 x 20 = 40 marks)

19(a) Solve graphically the following LPP:

Maximize $z = 10x_2 - 2x_1$

subject to the constraints:

$$x_1 - x_2 \geq 0$$
$$-x_1 + 5x_2 \geq 5$$
$$x_1, x_2 \geq 0.$$

(10)

(b) Write the characteristics of the standard form of LPP. (10)

20(a) Obtain initial basic feasible solution of the following transportation problem using Vogel's method.

Origin	Destination			Supply
	D_1	D_2	D_3	
O_1	13	15	16	17
O_2	7	11	2	12
O_3	19	20	9	16
Demand	14	8	23	

(10)

(b) Explain the concept of EOQ and draw the graph of EOQ. (10)

21. Determine the optimal sequence of jobs that minimizes the total elapsed time based on the following information on processing time on machines given in hours and passing is not allowed:

Job :	A	B	C	D	E	F	G
Machine M_1 :	3	8	7	4	9	8	7
Machine M_2 :	4	3	2	5	1	4	3
Machine M_3 :	6	7	5	11	5	6	12

Find the minimum total elapsed time and the idle time of the machines.

22. A project consists of eight activities with the following relevant information:

Activity	Immediate Predecessor	Estimated duration (days)		
		Optimistic	Most likely	Pessimistic
A	--	1	1	7
B	--	1	4	7
C	--	2	2	8
D	A	1	1	1
E	B	2	5	14
F	C	2	5	8
G	D, E	3	6	15
H	F, G	1	2	3

(i) Draw the PERT network and find out the expected project completion time.

(ii) What duration will have 95% confidence for project completion? (20)

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