LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

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

THIRD SEMESTER – **NOVEMBER 2013**

ST 3103 - RESOURCE MANAGEMENT TECHNIQUES

Date : 04/11/2013 Dept. No. Max. : 100 Marks

Time : 1:00 - 4:00

SECTION - A

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

1. Define the following terms used in a General Linear Programming Problem:
   (i) objective function (ii) constraints.
2. What is an unbounded solution in an LPP?
3. Explain the role of slack and surplus variables in an LPP.
4. Show that a Transportation Problem can be expressed as an LPP.
5. What is meant by a LOOP in a transportation Table? Give an example.
6. Explain the following terms used in Sequencing:
   (i) total elapsed time (ii) No passing rule
7. Define the following terms used in a PERT network:
   (i) optimistic time (ii) pessimistic time.
8. Write a note on the following terms used in Inventory:
   (i) set up cost (ii) ordering cost.
9. When is meant by a critical activity?
10. Explain the following factors which play an important role in inventory control:
    (i) lead time (ii) order cycle.

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 are required to be produced in a day. Assume that all the units produced are consumed in the market. Formulate this problem as an LPP.

12. Use graphical method to solve the following LPP:
Minimize $z = 2x_1 + x_2$
subject to the constraints:

$$x_1 + x_2 \leq 1$$
$$-3x_1 + x_2 \geq 3$$
$$x_1, x_2 \geq 0.$$

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

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

Are the solutions degenerate?

14. Solve the following LPP using simplex method:
Maximize $z = 5x_1 + 4x_2$
subject to the constraints:

$$4x_1 + 5x_2 \leq 10$$
$$3x_1 + 2x_2 \leq 9$$
$$8x_1 + 3x_2 \leq 12$$
$$x_1, x_2 \geq 0.$$

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

Destination

Origin	*Calicut*	*Bangalore*	*Mumbai*	*Pune*	*Availability*
Cochin	*1*	*2*	*1*	*4*	*30*
Chennai	*3*	*3*	*2*	*1*	*50*
Hyderabad	*4*	*2*	*5*	*9*	*20*
Requirement	*20*	*40*	*30*	*10*	

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

Job

Persons	*I*	*II*	*III*	*IV*	*V*
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*

Assign the jobs to different persons so that the total cost is minimized.

17. There are nine tasks, each of which must go through two machines A and B in the order A, B. Processing times in hours are given in the table below:

Task	*I*	*II*	*III*	*IV*	*V*	*VI*	*VII*	*VIII*	*IX*
Machine A	*2*	*5*	*4*	*9*	*6*	*8*	*7*	*5*	*4*
Machine B	*6*	*8*	*7*	*4*	*3*	*9*	*3*	*8*	*11*

Determine a sequence for the nine tasks that will minimize the total elapsed time.

18. A project consists of a series of tasks with the following relationships:
A < D, E; B,D < F; C < G; B, G < H; F,G < I
Construct a network diagram with these relationships and find the minimum time of completion of the project, when the time of completion of each task is as follows:

Task	*A*	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*
Time	*23*	*8*	*20*	*16*	*24*	*18*	*19*	*4*	*10*

SECTION – **C**

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

19. Solve the following LPP using simplex method:
Maximize $z = 107x_1 + x_2 + 2x_3$

subject to the constraints:

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

20(a). Using least cost method, determine an initial basic feasible solution to the following transportation problem:

Destination

Origin	D_1	D_2	D_3	D_4	*Availability*
O_1	*1*	*2*	*3*	*4*	*6*
O_2	*4*	*3*	*2*	*0*	*8*
O_3	*0*	*2*	*2*	*1*	*10*
Requirement	*4*	*6*	*8*	*6*	

Hence obtain an optimum basic feasible solution using MODI method. (14)

(b). Describe the term EOQ using the graph of EOQ. (6)

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

Job

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

22. A project is composed of eleven activities, the time estimates for which are given below:

Activity	*Optimistic time*	*Normal time*	*Pessimistic time*
1-2	*7*	*9*	*17*
1-3	*10*	*20*	*60*
1-4	*5*	*10*	*15*
2-5	*50*	*65*	*110*
2-6	*30*	*40*	*50*
3-6	*50*	*55*	*90*
3-7	*1*	*5*	*9*
4-7	*40*	*48*	*68*
5-8	*5*	*10*	*15*
6-8	*20*	*27*	*52*
7-8	*30*	*40*	*50*

Draw the network diagram for the project and determine the critical path. Calculate total float.