LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

B.A. DEGREE EXAMINATION – **ECONOMICS**

THIRD SEMESTER – APRIL 2010

ST 3103 / 3100 - RESOURCE MANAGEMENT TECHNIQUES

Date & Time: 28/04/2010 / 1:00 - 4:00 Dept. No. Max. : 100 Marks

SECTION - A

Answer all questions **10 x 2 = 20**

1. What is an operational research?
2. What are the essential characteristics of operational research?
3. Write any two limitations of operational research.
4. What is an unbounded solution?
5. Define optimal feasible solution?
6. Define degeneracy in transportation problem?
7. Define unbalanced assignment problem.
8. Define total float and free float.
9. What is lead time?
10. Explain total inventory cost.

SECTION - B

Answer any two questions **5 x 8 = 40**

11. XYZ factory manufactures two articles A and B. to manufacture the article, a certain machine has to be worked for 1.5 hours and in addition a craftsman has to work 2 hours. To manufacture the article B, the machine has to be worked for 2.5 hours and in addition the craftsman has to work for 1.5 hours. In a week the factory can avail of 80 hours of machine time and 70 hours craftsman's time. The profit on each article A is Rs. 50 and that on each article Rs. 40. If all the articles produced can be sold away, find how many of each kind should be produced to earn the maximum profit per week. Formulate the problem as linear programming model.

12. Maximize (total profit) $Z = 80x_1 + 120x_2$
    Subject to the constraints
    $x_1 + x_2 \leq 9$
    $x_1 \geq 2$
    $x_2 \geq 3$
    $20x_1 + 50x_2 \leq 360$
    $x_1 \geq 0$ and $x_2 \geq 0$
    Solve the above problem by using graphical method.

13. A company is spending Rs, 1,000 on transportation of its units from three plants to four distribution centres. The supply and demand of units, with unity cost of transportation are given as:

		Distribution Centre				
		D_1	D_2	D_3	D_4	Availability
	P_1	19	30	50	12	7
Plant	P_2	70	30	40	60	10
	P_3	40	10	60	20	18
	Requirements	5	8	7	15	

What can be the maximum saving by optimal scheduling by using Vogel's Approximation Method?

14. Various activities of small project and other relevant information have been shown in the following table:

Activity	Most optimistic (a)	Most likely time (in days) (m)	Most Pessimistic time (in days) (b)
1 – 2	4	8	12
2 – 3	1	4	7
2 – 4	8	12	16
3 – 5	3	5	7
4 – 5	0	0	0
4 – 6	3	6	9
5 – 7	3	6	9
5 – 8	4	6	8
7 – 9	4	8	12
8 – 9	2	5	8
9 – 10	4	10	16
6 - 10	4	6	8

Calculate expected time (t_e) and variance (σ_i^2) for each activity of the project.

15. Six jobs go first over machine I and then over machine II. The order of completion of jobs has no significance. The following table gives machine time for the six jobs and the two machine:

	Time (in hours)					
Job	1	2	3	4	5	6
Machine I	5	9	4	7	8	6
Machine II	7	4	8	3	9	5

Find the sequence of the job that minimized the total elapsed time to complete the jobs. Also work out the total elapsed time for an optimal sequence. What is the total idle time on machine I and on machine II?

16. Distinguish between CPM and PERT.

17. A project has the following characteristic:

Activity	Preceding activity	Duration
A	None	5
B	None	2
C	A	6
D	A	12
E	C	10
F	D	9
G	B	5
H	E,F,G	9

Draw a network diagram for the above project.

18. Write any four steps which are involved in developing an inventory model.

SECTION – C

Answer any two questions **2 x 20 = 40**

19. Solve the following Linear Programming problem using simplex method:
Max. $Z = 800x_1 + 600x_2 + 300\ x_3$
Subject to
$10x_1 + 4x_2 + 5x_3 \leq 2000$
$2x_1 + 5x_2 + 4x_3 \leq 1009$
$x_1, x_2, x_3 \geq 0$

20. Solve the following transportation problem using North-West corner rule for initial feasible solution.

    A company has 3 plants P_1, P_2 and P_3 each producing 50,100 and 150 units of a similar product respectively. There are five warehouses W_1, W_2, W_3, W_4 and W_5 having demand of 100, 70, 50, 40 and 40 units respectively.
    The cost of sending a unit from various plants to the warehouses differs as given by the cost matrix below. Determine a transportation schedule so that cost is minimized:

	W_1	W_2	W_3	W_4	W_5
P_1	20	28	32	55	70
P_2	48	36	40	44	25
P_3	35	55	22	45	48

21. Five different machines can do any of the five required jobs, with different profits resulting from each assignment as shown in the following table. Find out maximum profit possible through optimal assignment.

Job	Machine				
	A	B	C	D	E
1	30	37	40	28	40
2	40	24	27	21	36
3	40	32	33	30	35
4	25	38	40	36	36
5	29	62	41	34	39

22. A small assembly plant assembles PCs through 9 interlinked stages according to the following precedence / process:

Stage From to	Duration (hours)
1 – 2	2
1 – 3	2
1 – 4	1
2 – 5	4
3 – 6	8
3 – 7	5
4 – 6	3
5 – 8	1
6 – 9	5
7 – 8	4
8 – 9	3

a) Draw an arrow diagram (network) representing above assembly work.
b) Tabulate earliest start, earliest finish, latest start and latest finish time for all the stages.
c) Find the critical path and the assembly duration.
d) Tabulate total float and free float.

****