

Roll No.:

B.E/B.Tech. (FT) DEGREE END SEMESTER EXAMINATION APRIL/MAY 2012

INDUSTRIAL ENGINEERING BRANCH

III SEMESTER- (REGULATION 2008)

IE9202 – OPERATIONS RESEARCH-I

Answer All Questions

PART 'A' (10 x 2 = 20 Marks)

1. Name some areas where we can use OR technique.
2. What is meant by unbounded solution?
3. What is the use sensitivity analysis of LPP?
4. What is mixed integer programming?
5. How to resolve degeneracy in transportation problem.
6. What is meant by balanced assignment problem?
7. What is meant by minimum spanning tree?
8. Write the differences between PERT and CPM.
9. What is dynamic programming?
10. What is meant by forward and backward recursive function?

PART -B(5 x 16 = 80 Marks)

11. An oil refinery can blend three grades of crude oil to produce quality R and quality S petrol. Two possible blending processes are available. For each production run the older process uses 5 unit of crude A, 7 units of crude B and 2 units of crude C to produce 9 units of R and 7 units of S. The newer process uses 3 units of crude A, 9 units of crude B, and 4 units of crude C to produce 5 units of R and 9 units of S petrol.

Because of prior contract commitments the refinery must produce at least 500 units of R and at least 300 units of S for the next month. It has available of 1500 units of crude A, 1900 units of crude B and 1000 units of crude C. For each unit of R the refinery receives Rs.60 while for each unit of S it receives Rs.90. Find out the linear programming formulation of the problem so as to maximize the revenue.

12 a) A company has four factories F_1, F_2, F_3 which supply warehouses at $W_1, W_2,$ and W_3 weekly factory capacities, weekly warehouse requirements and unit shipping costs (in rupees) are as follows.

Factories	Warehouses			Supply
	W_1	W_2	W_3	
F_1	16	20	12	200
F_2	14	8	18	160
F_3	26	24	16	90
Demand	180	120	150	

Determine the optimal distribution for this company to minimize the shipping costs.

OR

12 b) In the modification of a plant layout of a factory four new machines M_1, M_2, M_3 and M_4 are to be installed in a machine shop. There are five vacant places A, B, C, D and E available. Because of limited space, machine M_2 cannot be placed at C and M_2 cannot be placed at A. The cost of locating of machine i to place j in rupee is shown in below table. Find the optimal assignment schedule.

	A	B	C	D	E
M_1	9	11	15	10	11
M_2	12	9	-	10	9
M_3	-	11	14	11	7
M_4	14	8	12	7	8

13 a) Maximize $Z = X_1 + X_2 + X_3$

ST

$$7X_1 - 5X_2 + X_3 \leq 7$$

$$-12X_1 + 15X_2 + X_3 \leq 7$$

$$X_1, X_2, X_3 \geq 0 \text{ and integer}$$

Solve the above LPP using cutting plane method.

OR

13 b) Maximize $Z = X_1 + X_2$

ST

$$7X_1 - 5X_2 \leq 7$$

$$-12X_1 + 15X_2 \leq 7$$

$$X_1, X_2 \geq 0 \text{ and integer}$$

Solve the above LPP using branch and bound algorithm

14 a) Consider the data of flow network as shown below

i) Draw the flow network

ii) Determine the maximum flow Node1 to Node6 and also the corresponding flow pattern using the matrix method.

Arc i-j	Flow	
	f_{ij}	f_{ji}
1-2	60	10
1-3	35	25
2-3	25	20
2-4	19	24
2-5	25	30

Arc i-j	Flow	
	f_{ij}	f_{ji}
3-4	35	-
3-5	30	28
4-5	45	-
4-6	40	-
5-6	55	-

OR

14 b) A project has the following characteristics:

Activity	Optimistic time	Most likely time	Pessimistic time
1-2	1	2	3
2-3	1	2	3
2-4	1	3	5
3-5	3	4	5
4-5	2	3	4
4-6	3	5	7
5-7	4	5	6
6-7	6	7	8
7-8	2	4	6
7-9	4	6	8
8-10	1	2	3
9-10	3	5	7

Construct a PERT network and find out the critical paths.

15 a) solve LPP using dynamic programming technique.

$$\text{Maximize } z = 8X_1 + 7X_2$$

Subject to

$$2X_1 + X_2 \leq 8$$

$$5X_1 + 2X_2 \leq 15$$

$$X_1, X_2 \geq 0$$

OR

15 b) In the given network you want find the shortest route between city 1 and city 7 using dynamic programming approach.

