



**DSP 14 (O)**

**Diploma in Statistical Process Control and Operations Research (DSPCOR)  
Examination, August 2014  
(Old Scheme)  
Paper – ST-IV : OPERATIONS RESEARCH (OR)**

Time : 3 Hours

Max. Marks : 90

**SECTION – I**

**(2×15=30)**

Answer **any two** questions :

1. a) Write the procedure for solving LPP by graphical method.  
b) Solve the following by simplex method :  
Max  $z = 5x_1 + 8x_2$  subject to  $3x_1 + 2x_2 \leq 36$ ,  
 $x_1 + 2x_2 \leq 20$ ,  $3x_1 + 4x_2 \leq 42$  and  $x_1, x_2 \geq 0$ .
2. a) Explain briefly scope of OR.  
b) Determine an initial feasible solution to the following TP using Vogel's approximation method.

Origin	Destination				Supply
	D <sub>1</sub>	D <sub>2</sub>	D <sub>3</sub>	D <sub>4</sub>	
A	11	13	17	14	250
B	16	18	14	10	300
C	21	24	13	10	400
Demand	200	225	275	250	950

3. a) Write the assumptions in Economic Order Quantity when shortages are allowed.  
b) A particular item has a demand of 9000 units per year. The cost of one procurement is Rs. 100 and holding cost per unit is Rs. 2.40 per year. The replenishment is instantaneous and the shortage cost is Rs. 5 per unit per year. Find EOQ and minimum total cost.

**P.T.O.**



4. a) Describe the various types of replacement problems.
- b) An engineering company is offered a material handling equipment A. A is priced at Rs. 60,000 including cost of installation and the costs for operation and maintenance are estimated to be Rs. 10,000 for each of the first 5 years, increasing every year by Rs. 3,000 per year in the sixth and subsequent year. The company expects a return of 10% on all its investments. What is the optimal replacement period ?

SECTION – II

(4×10=40)

Answer **any 4** questions :

5. What is a model ? Discuss various classification schemes of model.
6. An animal food company must produce 200 kgs of a mixture consisting of ingredients  $x_1$  and  $x_2$  daily.  $x_1$  costs Rs. 3 per kg and  $x_2$  costs Rs. 8 per kg. Not more than 80 kg of  $x_1$  can be used and at least 60 kg of  $x_2$  must be used. Formulate a LP model to minimize the cost.
7. Solve the following LPP graphically :  

$$\text{Min } z = 20x_1 + 10x_2 \text{ subject to } x_1 + 2x_2 \leq 40, 3x_1 + x_2 \geq 30, 4x_1 + 3x_2 \geq 60 \text{ and } x_1, x_2 \geq 0.$$
8. For the transportation problem

	D <sub>1</sub>	D <sub>2</sub>	D <sub>3</sub>	D <sub>4</sub>	a <sub>i</sub>
O <sub>1</sub>	1	2	1	4	30
O <sub>2</sub>	3	3	2	1	50
O <sub>3</sub>	4	2	5	9	20
b <sub>j</sub>	20	40	30	10	

initial B.F.S. due to VAM is

$O_1 \rightarrow D_1 - 20, O_1 \rightarrow D_3 - 10, O_2 \rightarrow D_1 - 20, O_2 \rightarrow D_3 - 20, O_2 \rightarrow D_4 - 10$  and  $O_3 \rightarrow D_2 - 20$ , test the optimality of this BFS.

9. The demand for a purchased item is 1000 units per month and shortages are allowed. If the unit cost is Rs. 1.50 per unit, the cost of making one purchase is Rs. 600, the holding cost for one unit is Rs. 2 per year and the cost of shortage is Rs. 10 per year, determine : (i) the optimum purchase quantity (ii) the number of orders per year (iii) the optimum total yearly cost.
10. Why is maintenance of inventory essential ? In an inventory policy, what do the terms : (i) scheduling period and (ii) lead time mean.



- 11. Write a brief note on replacement problems.
- 12. Find the sequence that minimizes the total elapsed time required to complete the following tasks on two machines.

Task	:	I	II	III	IV	V	VI	VII	VIII	IX
Machine A	:	4	10	8	18	12	16	14	10	8
Machine B	:	12	16	14	8	6	18	6	16	22

SECTION – III

Answer **any 4** questions :

**(4×5=20)**

- 13. Define (i) feasible solution (ii) optimal solution (iii) unbounded solution.
- 14. Write the steps involved in formulation of LPP. Egg contains 6 units of Vitamin A per gram and 7 units of Vitamin B per gram and cost 12 paise per gram. Milk contains 8 units of Vitamin A per gram and 12 units of Vitamin B per gram and costs 20 paise per gram. The daily minimum requirement of Vitamin A and Vitamin B are 100 units and 12 units respectively. Formulate the problem as a LPP.
- 15. Write the steps involved in North West corner rule method to find BFS of transportation problem.
- 16. Solve the following assignment problem using Hungarian method.

	I	II	III	IV
1	0	18	9	3
2	9	24	0	22
3	23	4	3	0
4	9	16	14	0

- 17. Explain set up cost and lead time.
  - 18. Explain EOQ problem with one price break.
  - 19. Write the replacement policies for items that fail completely.
  - 20. Write the steps involved in 'Johnson's method' for determining optimal sequence of n jobs on two machines.
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