21COM2C7L

M.Com. II Semester Degree Examination, October - 2023
COMMERCE
Operations Research for Business Decisions
(NEP)

Time : 3 Hours   Maximum Marks : 70

Note : *Answer **any five** of the following questions with Question No. **1** is **Compulsory**. Each question carries **FOURTEEN** marks.*

1. (a) Define operations research. Explain the phases of Operation Research (OR) study. **7**

   (b) Solve graphically the following LPP : **7**
   Minimize $Z = 3X_1 - 2X_2$
   Subject to constraints
   $-2X_1 + 3X_2 \leq 9$
   $X_1 - 5X_2 \geq -20$
   $X_1, X_2 \geq 0$ (Non-negativity constraints)

2. Use the Simplex Method to solve the (LP) model : **14**
   Minimize $Z = 4x_1 + 10x_2$
   Subject to constraints
   $2x_1 + x_2 \leq 10$
   $2x_1 + 5x_2 \leq 20$
   $2x_1 + 3x_2 \geq 18$
   $x_1, x_2 \geq 0$

3. Determine an Initial Basic Feasible Solution to the following transportation problem using - **14**
   (a) Least Cost Method
   (b) Vogel's Approximation Method

Destinations		A	B	C	D	E	Supply
Origins	**X**	2	11	10	3	7	4
	Y	1	4	7	2	1	8
	Z	3	9	4	8	12	9
Demand		3	3	4	5	6	21

4. (a) The data collected in running a machine, the cost of which is Rs. 60,000 are given below.   **7**

Year	1	2	3	4	5
Resale Value	42000	30000	20400	14400	9650
Cost of Spares	4000	4270	4880	5700	6800
Cost of Labour	14000	16000	18000	21000	25000

Determine the optimum period for the replacement of the machine.

(b) A company is considering purchasing a new grinder, which will cost Rs.10,000/-. The economic life of the machine is expected to be 6 years. The salvage value of the machine will be Rs. 2,000/-. The average operating and maintenance costs are estimated to be Rs. 5,000/- per annum.   **7**

    (i) Assuming an interest rate of 10% determine the present value of future cost of the proposed grinder.

    (ii) Compare this grinder with the presently owned grinder that has an annual operating cost of Rs. 4,000/- per annum and expected maintenance cost of Rs. 2,000/- in the second year with an annual increase of Rs. 1,000/- thereafter.

5. A project schedule has the following characteristics as shown in the below table :   **14**

Activity	Name	Time	Activity	Name	Time (days)
1 - 2	A	4	5 - 6	G	4
1 - 3	B	1	5 - 7	H	8
2 - 4	C	1	6 - 8	I	1
3 - 4	D	1	7 - 8	J	2
3 - 5	E	6	8 - 10	K	5
4 - 9	F	5	9 - 10	L	7

(a) Construct network diagram and find out the critical path.

(b) Find the time estimates for all activities.

6. (a) Solve the following assignment problem shown in Table using Hungarian **7**
Method.

Men					
Jobs	I	II	III	IV	V
A	12	8	7	15	4
B	7	9	17	14	10
C	9	6	12	6	7
D	7	6	14	6	10
E	9	6	12	10	6

(b) Describe the computational procedure of obtaining optimum solution under **7**
Simplex method.

7. (a) Find the cost per period of individual replacement policy of an installation of **7**
300 bulbs, given the following :

(i) Cost of individual replacement of bulb is Rs. 2/- per bulb.

(ii) Conditional probability of failure of bulbs is as follows.

Weekend	0	1	2	3	4
Probability of failure	0	0.1	0.3	0.7	1.0

7

(b) Write the rules for constructing the network diagram.

8. Write short notes on following :

(a) Method to resolve the degeneracy **5**

(b) Application of PERT/CPM **5**

(c) Differentiate between North West Corner method and Minimum Matrix **4**
method.

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