21COM2C7L

M.Com. II Semester Degree Examination, Sept./Oct. - 2024
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. Discuss the Modelling in OR.   **4**

(b) The manufacturer of patent medicines is proposed to prepare a production plan for medicines A and B. There are sufficient ingredients available to make 20,000 bottles of medicine A and 40,000 bottles of medicine B. However, there are only 45,000 bottles into which either of medicines can be filled. Further, it takes 3 hours to prepare enough material to fill 1,000 bottles of medicine A and 1 hour to prepare enough material to fill 1,000 bottles of medicine B and there are 66 hours available for this operation. The profit is Rs. 8 per bottle of medicine A and Rs. 7 per bottle of medicine B. Formulate the problem as LPP.   **5**

(c) Solve the following LPP using Graphical Method :   **5**

Maximize $Z = 40x_1 + 60x_2$

Subject to constraints

$2x_1 + x_2 \leq 70$

$x_1 + x_2 \geq 40$

$x_1 + 3x_2 \leq 90$

Where $x_1, x_2 \geq 0$ (non-negativity constraints)

2. Solve the following LPP using Simplex method :   **14**

Maximize $Z = 2x_1 + 5x_2$

Subject to constraints

$x_1 \leq 40$

$x_2 \leq 30$

$x_1 + x_2 \leq 30$

Where $x_1, x_2 \geq 0$ (non-negativity constraints)

3. Determine an Initial Basic Feasible Solution to the following transportation problem **14**
using :
(i) Northwest Corner Rule
(ii) Least Square Cost Method
(iii) Vogel's Approximation Method

Destinations		A	B	C	D	E	Supply
Origins	X	5	7	10	5	3	5
	Y	8	6	9	12	4	10
	Z	10	9	8	10	15	10
Demand		3	3	10	5	4	25

4. The following failure rates have been observed for a certain type of fuses : **14**

Months	1	2	3	4	5
Percentage failing by the end of the months	5	15	35	75	100

There are 1,000 fuses in use and it costs Rs. 5 to replace an individual fuse. If all
fuses are replaced simultaneously, it would cost Rs. 1.25/fuse. It is proposing to
replace all fuses at fixed intervals of time, whether or not they have got burnt and
to continue replacing burnt out fuses as they fail. At what intervals the group
replacement should be made ? Also prove that this optimal policy is superior to
the straight forward policy of replacing each fuse only, when it fails.

5. The scheduled completion time of a project is 48 days. Calculate probability of **14**
finishing the project within this time :

Activity	To	Tm	Tp
10-20	4	8	12
20-30	1	4	7
30-50	3	5	7
20-40	8	12	16
40-50	0	0	0
40-60	3	6	9
50-70	3	6	9
50-80	4	6	8
60-100	4	6	8
70-90	4	8	12
80-90	2	5	8
90-100	4	10	16

   (a)   Draw a PERT network.
   (b)   Find the critical path.
   (c)   Find the starting and ending time estimates.
   (d)   Find early and late start, early and late finish.
   (e)   What is the probability of completing the project in 48 days for the critical path ?
   (f)   How many days are required to complete 95% of the project ?

6.   (a)   What is degeneracy in simplex ? Describe the steps of resolving the degeneracy in simplex method with illustration.   **7**

    (b)   Solve the following problem using Hungarian approach :   **7**

Men		I	II	III	IV	V
	A	1	3	2	8	8
	B	2	4	3	1	5
Tasks	**C**	5	6	3	4	6
	D	3	1	4	2	2
	E	1	5	6	5	4

7.   (a)   A Company has the option to buy one of the mini computers. Mini-computers costs Rs.5,00,000 and running and maintenance costs are Rs.60,000 for each of the first 5 years and increasing by Rs. 20,000 per year in the 6th and subsequent years. Chip computer has the same capacity as mini computer. But costs Rs. 2,50,000, however its running and maintenance costs are Rs.1,20,000 per year in first 5 years and increases by Rs. 20,000 per year thereafter. If the money worth is 10% per year, which computer should be purchased ? What are the optimal replacement periods for each one of the computers ? Assume that there is no salvage value for either of the computers.   **7**

    (b)   Draw the network diagram to the following alternatives activities, find the critical activity and total slack of the activities :   **7**

Job	A	B	C	D	E	F	G	H	I	J	K
Job time (Days)	13	8	10	9	11	10	8	6	7	14	18
Immediate Predecessor	-	A	B	C	B	E	D,E	E	H	G,I	J

8.   (a)   What is Hungarian Approach ? State the steps followed in Hungarian Approach.   **5**

    (b)   Differentiate between PERT and CPM.   **5**

    (c)   What is Replacement Cost ? How Individual Replacement differ from Group Replacement ?   **4**

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