Dec.-22-0245

ME-604 (Operations Research)

B.Tech. 6th (CBCS)

Time : 3 Hours   Max. Marks : 60

The candidates shall limit their answers precisely within the answer-book (40 pages) issued to them and no supplementary/continuation sheet will be issued.

Note : Attempt *one* questions from each Section A, B, C and D. Question no. 9 is compulsory. Any missing data may be assumed appropriately.

SECTION - A

1. (a) Determine the solution space and the optimum solution of the Reddy Mikks model for each of the following independent changes:

   (i) The maximum daily demand for exterior paint is at most 2.5 tons.

   (ii) The daily demand for interior paint is at least 2 tons.

   (iii) The daily demand for interior paint is exactly 1 ton higher than that for exterior paint.

   (iv) The daily availability of raw material MI is at least 24 tons.   (4)

   (b) Solve the following LPP

   Minimize: $Z = 3x_1 + 8x_2$

   Subject to; $x_1 + x_2 \geq 8$; $2x_1 - 3x_2 \leq 0$; $x_1 + 2x_2 \leq 30$; $3x_1 - x_2 \geq 0$; $x_1 \leq 10$; $x_2 \geq 9$; $x_1, x_2 \geq 0$ (6)

OR

2. ChemLabs uses raw materials I and II to produce two domestic cleaning solutions. A and B. The daily availabilities of raw materials I and II are 150 and 145 units respectively. One unit

of solution A consumes 0.5 unit of raw material I and 0.6 unit of raw material II, and one unit of solution B uses 0.5 unit of raw material I and 0.4 unit of raw material II. The profits per unit of solutions A and B are $8 and $10, respectively. The daily demand for solution A lies between 30 and 150 units, and that for solution B between 40 and 200 units. Find the optimal production amounts of A and B.   (10)

SECTION - B

3. Solve the following LPP

   Maximize: $Z = 34x_1 + 3x_2$

   Subject to; $x_1 + x_2 \leq 50$; $x_1 + 2x_2 \geq 80$; $3x_1 + 2x_2 \geq 140$;

   where $x_1, x_2 \geq 0$ (10)

OR

4. A cement factory manager is considering the least way to transport cement from his three manufacturing centres P, Q, R to depots A, B, C, D and E. The weekly production and demands along with transportation costs are given below:

	A	B	C	D	E	Supply (Tons)
P	4	1	3	4	4	60
Q	2	3	2	2	3	35
R	3	5	2	4	4	40
Demand (Tons)	22	45	20	18	30	135

What should be the distribution programme?   (10)

SECTION - C

5. A manufacture wants to ship 8 loads of his product as shown below. The matrix gives the mileage from origin to the destination D.

Origin	Destination			Available
	A	B	C	
X	50	30	220	1
Y	90	45	170	3
Z	50	200	50	4
Required	3	3	2	

Shipping costs are Rs 30 per load per mile. What shipping schedule should be used? Use Modi method to test its optimality.

(10)

OR

6. Solve the following game by graphic method where pay off matrix has been prepared for player A.

B ⟶		A	
		I	II
	I	45	40
	II	35	50
	III	70	35
	IV	50	30

(10)

SECTION - D

7. A product comprised of 10 activities whose normal time and cost are given as follows:

Activity	1-2	2-3	2-4	2-5	3-5	4-5	5-6	6-7	6-8	7-8
Normal time (days)	3	3	7	9	5	0	6	4	13	10
Normal cost (Rs.)	50	5	70	120	42	0	54	67	130	166

Indirect cost is Rs. 9 per day.

1. Draw the network and identify the critical path.

2. What is the project duration and associated with each activity?

(10)

OR

8. The following table gives the activities for buying a new car. Construct the project network. (10)

	Activity	Predecessor(s)	Duration (days)
A:	Conduct feasibility study	-	3
B:	Find potential buyer for present car	A	14
C:	List possible models	A	1
D:	Research all possible models	C	3
E:	Conduct interview with mechanic	C	1
F:	Collect dealer propaganda	C	2
G:	Compile pertinent data	D,E,F	1
H:	Choose top three models	G	1
I:	Test-drive all three choices	H	3
J:	Gather warranty and financing data	H	2
K:	Choose one car	I, J	2
L:	Choose dealer	K	2
M:	Search for desired color and options	L	4
N:	Test-drive chosen model once again	L	1
O:	Purchase new car	B,M,N	3

SECTION - E

9. (a) When can the dual Simplex method be applied?

(b) List the application of Operations Research in functional areas of management.

(c) What is a mixed integer programming problem?

(d) What is a quantity discount model?

(e) List the application of queueing theory.

(f) What is sensitivity analysis?

(g) How does a travelling salesman problem differ from a routine assignment model?

(h) What is meant by EOL?

(i) What are the transient nodes in a transportation problem?

(j) Define degenerate solution in Linear Programming Problem. (10×2=20)