Paper Name: Quantitative Techniques for Management

Vth Semester

Question Bank

Q1 Four operators O_1, O_2, O_3 & O_4 are available to a manager who has to get four jobs J_1, J_2, J_3 & J_4 done by assigning one job to each operator. Given the time needed by different operators for different jobs in the matrix below:

Operator/Job	**J_1**	**J_2**	**J_3**	**J_4**
O_1	4	7	5	6
O_2	-	8	7	4
O_3	3	-	5	3
O_4	6	6	4	2

i) How should manager assign the jobs so that the total time needed for all four jobs is minimum if operator O_2 cannot be assigned to J_1 & operator O_3 cannot be assigned to J_2?

Formulate LPP Model

Q2Given below are the objective function, the constraints and the final simplex tableau for linear programming product mix problem.

Objective function Z = 2x1 + 3x2+ 4x3

Constraints

3x1+x2+6x3< 600

2x1+4x2+2x3>480

2x1+3x2+3x3=540

X1,x2,x3>0

Final Simplex Tableau

CB	Cj (Product mix)	x1	x2	x3	s1	s2	s3	Quantity
4	x3	5/11	0	1	2/11	1/22	0	860/11

3	x2	3/11	1	0	-1/11	-3/11	0	840/11
-M	A2	-2/11	0	0	-3/11	15/22	1	540/11
	ZJ							

a)Write the optimal product mix and the profit contribution shown by the above solution

b) Is this solution feasible?

c) What is the role of slack variable in Simplex problems

Q3 The supplies and demand as also the cost per transportation from factory to warehouse in rupees per unit of product are given in the following table.

Factory	**W1**	**Warehouses** W_2	W_3	W_4	**Available Units**
A	25	55	40	60	60
B	35	30	50	40	140
C	36	45	26	66	150
D	35	30	41	50	50
Required Units	90	100	120	140	

a) Derive optimal strategy of transportation of goods from factories to warehouses and assess the optimal cost
b) If a new transporter agrees to transport goods from factory C to warehouse W at unit cost of Rs 50 , analyse the impact of this on your current optimal solution.

Q4 Solve the following LP problem

Max $Z = 30X_1 + 20X_2$

subject to the Constraints

$-X_1 - X_2 \geq -8$
$-6X_1 - 4X_2 \leq -12$
$5X_1 + 8X_2 = 20$
$X_1, X_2 \geq 0$
(Clearly show all additional variables introduced & also variables dropped & entered at each stage)

b) What are slack, surplus & artificial variables?

Q.4 a) You are given a following transportation problem

X1/W1	**W1**	**W2**	**W3**	**W4**	**Available Units**
X1	6	1	9	3	70
X2	11	5	2	8	55
X3	10	12	4	7	90
Required Units	85	35	50	45	215

An initial basic solution to the above problem was obtained as X_{13} = 50 units, X_{14}=20 units & X_{21} = 55, X_{31} = 30 units, X_{32} = 35 & X_{34} = 25 units. You are required to test whether this is an optimal solution, if not then modify & obtain an optional solution. (Use MODI Method)

b) What are row & column penalty?

Q5 Solve the following LP problem

Min $Z = 8X_1 + 4X_2$

subject to the Constraints

$3X_1 + X_2 \geq 27$

$X_1 + X_2 = 21$

$X_1 + 2X_2 \leq 40$

$X_1, X_2 \geq 0$

(Clearly show all additional variables introduced & also variables dropped & entered at each stage)

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Q6 Four operators O_1, O_2, O_3 & O_4 are available to a manager who has to get four jobs J_1, J_2, J_3 & J_4 done by assigning one job to each operator. Given the time needed by different operators for different jobs in the matrix below:

O1/J1	**J1**	**J2**	**J3**	**J4**
O1	12	10	10	8
O2	14	12	15	11
O3	6	10	16	4
O4	8	10	9	7

i)How should manager assign the jobs so that the total time needed for all four jobs is minimum?

ii)If job J_2 is not to be assigned to operator O_2, what should be the assignment over how much additional total time will be required?

Q7 A project has the following activities & other characteristics

Activity	Preceding Activity	Most Optimistic	Most likely	Most pessimistic
A	-	4	7	16
B	-	1	5	15
C	A	6	12	30
D	A	2	5	8
E	C	5	11	17
F	D	3	6	15
G	B	3	9	27
H	E,F	1	4	7
I	G	4	19	28

I) Draw the PERT network diagram & identify the critical path.
II) Determine the mean project completion time.
III) If the manager wishes to be 99% sure that the project is completed on 30th June 2010, when should he start the project work?
IV) Find the probability that the project will take more than 36 weeks but not more than 40 weeks.

Q.8 The following table gives data on normal time cost & crash time cost for a project.

Activity	Normal		Crash	
	Time (days)	Cost (Rs.)	Time (days)	Cost (Rs.)
1-2	6	600	4	1000
1-3	4	600	2	2000
2-4	5	500	3	1500
2-5	3	450	1	650
3-4	6	900	4	2000
4-6	8	800	4	3000
5-6	4	400	2	1000
6-7	3	450	2	800

The indirect cost per day is Rs.100, you are required to do the following:
i) Draw a network diagram, calculate earliest & latest finish time for each activity.
ii) Determine the critical path & calculate the normal project time & cost.
iii) Shorten the duration of the project by **one week** & then redraw the network schedule & determine the project cost.

Identify the new critical path. Also determine which activity should be selected for next round of crashing. (Do not crash this activity)

Q9 A project has the following activities :

Activity	Preceding Activity	Duration
A	-	4
B	-	7
C	-	6
D	A,B	5
E	A,B	7
F	C,D,E	6
G	C,D,E	5

i)Draw the network diagram.
ii)Determine the earliest &latest finish times.
iii)Identify the critical path.

Q10 The two players A& B have a bet with each other in rolling two die. If the two die turns six, A is paid Rs10 & if it does not turn six in both the die, he is paid Rs 4. Player B is paid Rs 5 when two die does not match. Given the choice of being A or B. Which one would you choose and what would be your strategy?

Q11 Explain the meaning of the following in relation to the game theory:-

(i) 'Switching strategies at random'
(ii) 'Each player making the best possible move'

Q12 Explain the role of Operation Research in managerial decision making.

Q13 Explain Principle of Dominance using an example.

Q14 What is Integer Programming?

Q15 Expalin the three time estimates in PERT?

Q 16 What is total float, free float & independent float. Explain with a help of an example

Q17 The two players A& B have a bet with each other in rolling two die. If the two die turns six, A is paid Rs10 & if it does not turn six in both the die, he is paid Rs 4. Player B is paid Rs 5 when two die does not match. Given the choice of being A or B. Which one would you choose and what would be your strategy?

Q18 Analyze pros & cons of operation research in managerial decision making.

Q19 What are Corner Points & Optimality in LPP.

Q20 Discuss the following :

i) Basis & Non Basis Variables
ii) Multi Stage Solution under Dynamic Programming
(iii) Corner Points & Optimality in LPP.
(iv) Event and an Activity