

1059

B.E. (Mechanical Engineering)

Eighth Semester

MEC-802: Operation Research

Time allowed: 3 Hours

Max. Marks: 50

NOTE: Attempt five questions in all, including Question No. 1 which is compulsory and selecting two questions from each Section.

X-X-X

- Q1. (a) Explain under what conditions artificial variables are added while solving LPP by simplex method?  $2 \times 5 = 10$
- (b) Define duality of a Linear Programming problem.
- (c) How the assignment problem can be viewed as a linear programming problem?
- (d) Explain why dummy activities are incorporated in a network?
- (e) Define the terms: Activity, Event, Total float and Independent float.

## Section A

- Q2. (a) Discuss the methodology for solving a problem in Operation Research. 5
- (b) A dietician has to develop a special diet using two foods P and Q. Each packet (containing 30 g) of food P contains 12 units of calcium, 4 units of iron, 6 units of cholesterol and 6 units of vitamin A. Each packet of the same quantity of food Q contains 3 units of calcium, 20 units of iron, 4 units of cholesterol and 3 units of vitamin A. The diet requires atleast 240 units of calcium, atleast 460 units of iron and at most 300 units of cholesterol. Formulate an LP model for the problem to determine how many packets of each food should be used to minimize the amount of vitamin A in the diet? 5

- Q3. Use Big-M method solve the following LPP; 10
- Minimize  $Z = 600x_1 + 500x_2$   
 subject to  $2x_1 + x_2 \geq 80$ ,  
 $x_1 + 2x_2 \geq 60$ ,  
 and  $x_1, x_2 \geq 0$

- Q4. Use dual simplex method to solve the following LP problem: 10

Minimize  $Z = 3x_1 + x_2$   
 subject to  $x_1 + x_2 \geq 1$ ,  
 $2x_1 + 3x_2 \geq 2$ ,  
 and  $x_1, x_2 \geq 0$

## Section B

- Q5. Consider the transportation problem presented in Table 1. 10

	$D_1$	$D_2$	$D_3$	$D_4$	$D_5$	$D_6$	Supply
$S_1$	5	3	7	3	8	5	3
$S_2$	5	6	12	5	7	11	4
$S_3$	2	1	3	4	8	12	2
$S_4$	9	6	10	5	10	9	8
Demand	3	3	6	2	1	2	

Table 1. Transportation cost table

Determine an initial feasible solution using following methods (i) NWCR (ii) VAM.

P.T.O.



(2)

- Q6. A travelling salesman has to visit 5 cities. He does not want to visit any city twice before completing the tour of all the cities and wishes to return to his home city, the starting station. The travelling cost (in thousands of Rupees) of each city from a particular city is given below. Find the least cost route. 10

		To city				
		1	2	3	4	5
From city	1	---	2	5	7	1
	2	6	---	3	8	2
	3	8	7	---	4	7
	4	12	4	6	---	5
	5	1	3	2	8	---

- Q7. (a) Explain different queue disciplines. 5  
 (b) Following is the list of activities associated with a construction company project. 5

Activity	A	B	C	D	E	F	G	H	I	J	K	L	M	N
Immediate Predecessor	-	A	B	C	C	E	D	E,G	C	F,I	J	J	H	K,L
Duration (in weeks)	2	4	10	6	4	5	7	9	7	8	4	5	2	6

Draw the network diagram and identify critical path.

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