

M.C.M. (Semester—II) Examination
OPERATION RESEARCH TECHNIQUES
Paper—2 MCM 5

Time : Three Hours]

[Maximum Marks : 80

N.B. :— (1) Due credit will be given to neatness and adequate dimensions.

(2) Assume suitable data wherever necessary.

(3) Illustrate your answer with the help of neat sketches wherever necessary.

1. (A) Explain limitation of Linear Programming. 4

(B) Use the Graphical method to solve the following I.P problem :

$$\text{Maximize } Z = 2x_1 + 4x_2$$

Subject to constraint

$$x_1 + 2x_2 \leq 4$$

$$2x_1 + x_2 \leq 6. \quad 6$$

(C) Explain application area of linear programming. 6

OR

2. (A) Use the simplex method to solve the following LP problem :—

$$\text{Max. } Z = 20x_1 + 6x_2 + 8x_3$$

subject to

$$8x_1 + 2x_2 + 3x_3 \leq 250$$

$$4x_1 + 3x_2 \leq 150$$

$$2x_1 + x_3 \leq 50$$

and $x_1, x_2, x_3 \geq 0$. 8

(B) Use the Big-M method to solve the following LP problem :—

$$\text{Minimize } Z = 5x_1 + 3x_2$$

Subject to constraints

$$2x_1 + 4x_2 \leq 12$$

$$2x_1 + 2x_2 = 10$$

$$5x_1 + 2x_2 \geq 10$$

and $x_1, x_2 \geq 0$. 8

3. (A) Solve the following game. Find :

- (1) Value of the game
- (2) Does the game have a saddle point ?

		Player B	
Player A	1	2	
	4	-3	

4

(B)

		Tasks			
		I	II	III	IV
Subordinates	A	8	26	17	11
	B	13	28	4	26
	C	38	19	18	15
	D	19	26	24	10

How should the tasks be allocated to subordinates so as to minimize the total Man-hours ?

6

(C) Determine an initial basic solution to the following transportation problem by using VAM method :—

	D1	D2	D3	Supply
S1	7	3	4	2
S2	2	1	3	3
S3	3	4	6	5
Demand	4	1	5	

6

OR

4. (A) Determine an initial basic feasible solution to the following transportation problem by using :—

- (1) NWCM
- (2) LCM

		Destination				
		D1	D2	D3	D4	Supply
Source	A	11	13	17	14	250
	B	16	18	14	10	300
	C	21	24	13	10	400
	Demand	200	225	275	250	

8

(B)

		Tasks			
		I	II	III	IV
Subordinates	A	8	26	17	11
	B	13	28	4	26
	C	38	19	18	15
	D	19	26	24	10

How should the tasks be allocated to subordinates so as to minimize the total man-hours ?

8

5. (A) Find the sequence that minimizes the total elapsed time and processing time in hours required to complete the following jobs :—

Job	:	1	2	3	4	5	6
Machine A	:	4	8	3	6	7	5
Machine B	:	6	33	7	2	8	4

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- (B) Explain :—

- (1) Purchase Cost
- (2) Carrying Cost
- (3) Ordering Cost
- (4) Total Inventory Cost.

8

OR

6. (A) Find the sequence that minimizes the total elapsed time required to complete the following tasks. Each job is processed in order ABC :—

Job	:	1	2	3	4	5
Machine A	:	5	7	6	9	5
Machine B	:	2	1	4	5	3
Machine C	:	3	7	5	6	7

8

- (B) The following table gives the machine times in hours for 9 jobs and two machines :—

Job	:	1	2	3	4	5	6	7	8	9
Machine I	:	2	5	4	9	6	8	7	5	4
Machine II	:	6	8	7	4	3	9	3	8	11

Find the elapse time and ideal time.

8

7. (A) A project has following activities and other characteristics :—

Activity	Time Estimates (weeks)		
	Optimistic	Most likely	Pessimistic
1-2	1	3	5
2-3	1	4	7
2-4	1	3	5
2-5	5	8	11
3-6	2	4	6
4-6	5	6	7
5-7	4	5	6
6-7	1	3	5

- (1) Draw the network diagram.
- (2) Identify critical path.
- (3) Find out ET & LT.
- (4) Find out variance and standard deviation.

3+1+2+4

(B) Explain :—

- (1) Events
- (2) Activities
- (3) Activity-on-Node
- (4) Activity-on-Arrow.

6

OR

8. (A) Explain :—

- (1) Optimistic time
- (2) Pessimistic time
- (3) Most likely time.

6

(B) The table consists of the following activities and their estimated times :

Activity	Predecessor	Time (days)
A	—	2
B	—	1
C	A	3
D	A, B	2
E	C, D	1
F	B, D	3
G	E, F	1

- (1) Draw Network diagram.
- (2) Find critical path.
- (3) Calculate project completion time.
- (4) Calculate total float and free float for each activity.

10

9. (A) Give in detail the steps in Revised simplex method.

8

(B) What are the advantages and disadvantages of simulation methods ?

8

OR

10. (A) What is simulation ? Give its types.

6

(B) Use dual simplex method to solve the following LP problem :

$$\text{Maximize } Z = 2x_1 - x_3$$

Subject to constraints

$$x_1 + x_2 - x_3 \geq 5$$

$$x_1 - 2x_2 + 4x_3 \geq 8$$

$$\text{and } x_1, x_2, x_3 \geq 0$$

10