M.C.A [SEM – III]

Operation Research

(DEC- 2017)

Q. P. Code: 24554

[Time: 3 hours] **[Marks: 100]**

Note:
- Question 1 is compulsory
- Answer any 4 from the remaining 6 questions
- Figures to the right indicate marks
- Use of scientific calculator is allowed

Q1 a) Solve the following LPP using Graphical Method

Maximize $Z = 40x_1 + 100x_2$

Subject to $12x_1 + 6x_2 \leq 3000$

$4x_1 + 10x_2 \leq 2000$

$2x_1 + 3x_2 \leq 900$

$x_1, x_2 \geq 0$ [10]

b) Suppose the following estimate of activity times (days) are provided.

Activity	Optimistic time	Most Likely time	Pessimistic time
1-3	1	3	5
1-2	3	4	5
3-5	4	5	6
2-4	3	5	7
4-5	5	6	13
5-6	4	7	10
4-6	6	8	10

i) Draw a network.
ii) Find the expected duration and variance for each activity
iii) What is the project length?
iv) Find the critical path of the project. [10]

Q2 a) Solve the following LPP by Simplex Method

Maximize $Z = 4x1 + 10x2$

Subject to $2x1 + x2 \leq 10$

$2x1 + 5x2 \leq 20$

$2x1 + 3x2 \leq 18$

$x1, x2 \geq 0$ [10]

b) Find the initial basic feasible solution for the following transportation problem by Vogel's approximation method:

	To				Supply
From	3	1	7	4	300
	2	6	5	9	400
	8	3	3	2	500
Demand	250	350	400	200	

[10]

Q3 a) Five jobs are to be processed at three machines A, B and C in the order ABC. The time taken by each job on the three machines is given below. Each machine can process one job at a time. Determine the optimum sequence for the jobs and total elapse time. Also find the idle time for each machine.

Task	Jobs				
	1	2	3	4	5
A	7	12	11	9	8
B	8	9	5	6	7
C	11	13	9	10	14

[10]

b) Solve the following LPP by Big-M method:

Maximize $Z = 3x1 - x2$

Subject to $2x1 + x2 \leq 2$

$x1 + 3x2 \geq 3$

$x2 \leq 4$

$x1, x2 \geq 0$ [10]

Q4 a) A salesman has to visit five cities A, B, C, D and E. The distance between 5 cities are as follows. If the salesman starts from city A and has to come back to city A. Which route will he select so that the total time to visit all cities will be minimum?

		To city				
		A	B	C	D	E
From City	A	0	7	6	8	4
	B	7	0	8	5	6
	C	6	8	0	9	7
	D	8	5	9	0	8
	E	4	6	7	8	0

[10]

b) Solve the following problem using Dual Simplex method:

Minimize $Z = 2x1 + 2x2 + 4x3$

Subject to $2x1 + 3x2 + 5x3 \geq 2$

$3x1 + x2 + 7x3 \leq 3$

$x1 + 4x2 + 6x3 \leq 5$

$x1, x2, x3 \geq 0$ [10]

[TURN OVER]

Q5 a) Use Two phase method to solve the following LPP:

Maximize $Z = 5x1 - 4x2 + 3x3$

Subject to $2x1 + x2 - 6x3 = 20$

$6x1 + 5x2 + 10x3 \leq 76$

$8x1 - 3x2 + 6x3 \leq 50$

$x1,x2,x3 \geq 0$ [10]

b) Solve the following assignment problem and find the optimum assignment that will result in the minimum man hours needed.

		Jobs				
		A	B	C	D	E
Workers	P	10	12	15	12	8
	Q	7	16	14	14	11
	R	13	14	7	9	9
	S	12	10	11	13	10
	T	8	13	15	11	15

[10]

Q6 a) Use Gomory's Method to solve the following problem:

Maximize $Z = 5x1 + 7x2$

Subject to $-2x1 + 3x2 \leq 6$

$6x1 + x2 \leq 30$

$x1,x2 \geq 0$ and integer [10]

b) The maintenance engineer for a large construction company is examining alternatives open to him for the replacement of hydraulic hoses in the firm's 100 front end loaders, each loader uses six hoses, which from historical maintenance records fail at following rate

Month of use	1	2	3	4	5
% requiring replacement by that month	10	15	20	70	100

The engineer learns that in field replacement costs Rs.80 per hose while it cost only Rs.40 per hose if all the hoses are replaced at regular interval during routine maintenance and service. Evaluate the alternatives open to this engineer and recommend a course of action. [10]

Q7 a) Write short note on :

i) Pure and Mixed strategies in game theory

ii) Inventory Model

[10]

b) Find the optimal strategies and value of the game for the following problem:

	Player B		
Player A	1	-1	-1
	-1	-1	3
	-1	2	-1

[10]
