

Seat No.: _____

Enrolment No. _____

GUJARAT TECHNOLOGICAL UNIVERSITY

MCA SEMESTER-IV EXAMINATION WINTER 2017

Subject Code: 640003

Date: 02-01-2018

Subject Name: Operations Research

Time: 02:30 pm to 05:00 pm

Total Marks: 70

Instructions:

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

- Q.1 (a)** Define the following terms: **14**
- i. Errors in network
 - ii. EOQ
 - iii. Customer behavior in Queuing model
 - iv. Sudden failure in Replacement model
 - v. Saddle point
 - vi. Random numbers
 - vii. Slack and Surplus variables

- Q.2 (a)** Use simplex method to solve the problem **07**
- Max $z = 4x_1 + 10x_2$
Subject to $2x_1 + x_2 \leq 50$
 $2x_1 + 5x_2 \leq 100$
 $2x_1 + 3x_2 \leq 90$
And $x_1, x_2 \geq 0$
- (b)** Solve the following LP problem graphically **07**
- Max $Z = 80x_1 + 55x_2$

Subject to $4x_1 + 2x_2 \leq 40$
 $2x_1 + 4x_2 \leq 32$
 $x_1, x_2 \geq 0$

OR

- (b)** What is Operation research? Explain the applications of OR. **07**

- Q.3 (a)** Determine the initial basic feasible solution using NWCM and VAM to the following transportation problem **07**

Sources	Distribution centre's				
	D1	D2	D3	D4	Supply
S1	2	3	11	7	6
S2	1	0	6	1	1
S3	5	8	15	9	10
Requirements	7	5	3	2	

- (b)** What is Simulation? What are the advantages and disadvantages of Simulation? **07**

OR

- Q.3 (a)** Solve the following game by maximin (minimax) principle, whose payoff matrix are given below: Include in your answer: (1) strategy selection for each player (2) the value of the game to each player. Does the game have a saddle point? **07**

Player A	Player B				
	B1	B2	B3	B4	B5
A1	3	-1	4	6	7
A2	-1	8	2	4	12
A3	16	8	6	14	12
A4	1	11	-4	2	1

- (b) A construction company has requested bids for subcontracts on five different projects. Five companies have responded their bids and are represented below: **07**

Bidders	Bid amounts ('000s Rs)				
	A	B	C	D	E
1	41	72	39	52	25
2	22	29	49	65	81
3	27	39	60	51	40
4	45	50	48	52	37
5	29	40	45	26	30

Determine the minimum cost assignment of subcontracts to bidders, assuming that each bidder can receive only one contract

- Q.4 (a) What is a queue? Explain the basic elements of queues with diagram. **07**
 (b) Ten jobs are to be processed on two machines M1 and M2. Determine the optimal sequence and evaluate the total elapsed time, besides the job and machine idle time. The job processing times (in hours) are given below in table. **07**

Machines	Job processing times in hours									
	J ₁	J ₂	J ₃	J ₄	J ₅	J ₆	J ₇	J ₈	J ₉	J ₁₀
M ₁	8	9	10	4	8	5	6	9	6	7
M ₂	5	3	7	7	6	8	3	7	8	7

OR

- Q.4 (a) Explain the difference between PERT and CPM. **07**
 (b) Machine A costs Rs 45,000 and its operating costs are estimated to be Rs 1000 for the first year increasing by Rs 10,000 per year in the second and subsequent years. Machine B costs Rs 50,000 and operating costs are Rs 2,000 for the first year, increasing by Rs 4,000 in the second and subsequent years. If at present we have a machine of type A, should we replace it with B? If so when? Assume that both machines have no resale value and their future costs are not discounted. **07**

- Q.5 (a) An aircraft company uses rivets at an approximate customer rate of 2,500 kg per year. Each unit costs Rs. 30 per kg and the company personnel estimate that it costs Rs. 130 to place an order, and that the carrying cost of inventory is 10 percent year. How frequently should orders for rivets be placed? Also determine the optimum size of each order. **07**
 (b) Describe the transportation problem with its general mathematical formulation **07**

OR

- Q.5 (a) Construct the dual of the problem **07**

$$\text{Min}_z = 3x_1 - 2x_2 + 4x_3$$

Subject to

$$\begin{aligned} 3x_1 + 5x_2 + 4x_3 &\geq 7, \\ 6x_1 + x_2 + 3x_3 &\geq 4, \\ 7x_1 - 2x_2 - x_3 &\leq 10, \\ x_1 - 2x_2 + 5x_3 &\geq 3, \\ 4x_1 + 7x_2 - 2x_3 &\geq 2, \end{aligned}$$

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

(b) A project schedule has the following characteristics

Activity	Time (Weeks)
1-2	4
1-3	1
2-4	1
3-4	1
3-5	6
4-9	5
5-6	4
5-7	8
6-8	1
7-8	2
8-10	5
9-10	7

- (i) Construct the network
- (ii) Compute E and L for each event
- (iii) Find Critical path and Total Float
