Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VII(OLD) • EXAMINATION – WINTER 2016

Subject Code: 171901 **Date: 29/11/2016**

Subject Name: Operation Research

Time: 10:30 AM to 01:00 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)** Explain definition & scope of operation research. **07**

(b) Solve by Simplex method **07**

Max $Z = 5X_1 + 6X_2 + X_3$

Subject to constraints

$9X_1 + 3X_2 - 2X_3 \leq 5$

$4X_1 + 2X_2 - X_3 \leq 2$

$X_1 - 4X_2 + X_3 \leq 3$

$X_1, X_2, X_3 \geq 0$

Q.2 **(a)** Explain the various elements of queuing system **07**

(b) Solve by graphical method. Use graph paper. **07**

Max $Z = 80X_1 + 120X_2$

Subject to constraints

$X_1 + X_2 \leq 9$

$100X_1 + 250X_2 \leq 1800$

$X_1 \geq 2$

$X_2 \geq 3$

$X_1, X_2 \geq 0$

OR

(b) Solve by Simplex method **07**

Max $Z = 2.5X_1 + 0.5X_2 - 0.5X_3 - 250$

Subject to constraints

$X_1 + X_2 + X_3 = 6500$

$X_1 \leq 3000$

$X_1, X_2, X_3 \geq 0$

Q.3 **(a)** Explain in detail with suitable examples the following costs in inventory control: **07**

i. Inventory carrying cost

ii. Ordering cost

iii. Shortage cost

(b) A supplier requires to deliver 9600 units of raw material in a year to his customer. The unit cost of product is Rs 80. the holding cost is 9% per annum of the product cost. Order cost is Rs 40 per order. Determine how much the supplier should order per order and at what should be ordering interval in days to minimize total inventory cost. Shortages are not permitted **07**

OR

Q.3 **(a)** Explain the different types of floats used in network problem. **07**

(b) The table below gives the time in hours for various activities **07**

Activity	Duration
1-2	2
1-3	2
1-4	1
2-5	4
3-6	8
3-7	5
4-6	3
5-8	1
6-9	5
7-8	4
8-9	3

i)Draw Network diagram
ii) Tabulate earliest start and finish times, latest start and finish times
iii) Find critical path and total project duration

Q.4 **(a)** How can a 'two person-zero sum game' problem be converted into LP problem? Illustrate with example. **07**

(b) For the two player game, find the value of the game using rule of dominance **07**

		Player B			
		B1	B2	B3	B4
Player A	A1	7	6	8	9
	A2	-4	-3	9	10
	A3	3	0	4	2
	A4	10	5	-2	0

OR

Q.4 **(a)** Explain in brief Transshipment problem and Travelling Salesman problem **07**

(b) A company has three plants X, Y and Z which can produce 5 different products A, B, C, D and E. The production capacity, product demand and cost of producing the products in different plants is given in following table **07**

		PRODUCT					Production capacity
		A	B	C	D	E	
PLANT	X	10	15	17	19	16	50
	Y	20	12	16	18	20	70
	Z	9	14	**	10	18	80
Requirement		40	50	60	30	70	

** plant Z cannot produce product C

Decide by using Vogel's method for initial feasible solution and MODI for optimal solution as to how much production of which produvt should be carried out in each plant to minimize total production cost.

Q.5 **(a)** What do you understand by 'zero-sum' in the context of game theory? **07**
Explain the meaning following terms used in game theory;
i. Saddle Point
ii. Pure Strategy
iii. Mixed Strategy

(b) A machine purchased for Rs 65000 has the estimate of running cost and resale values as given in the table: **07**

Year	1	2	3	4	5	6	7	8
Running cost (Rs)	14000	15000	17000	20000	24000	28000	33000	39000
Resale value(Rs)	40000	30000	22000	17000	13000	10000	10000	10000

Find after how many years machine should be replaced to have minimum average annual cost.

OR

Q.5 **(a)** What is the simulation? Classify the simulation model? Explain the general Simulation methodology **07**

(b) A company has 5 workers A, B, C, D and E. Each worker can work on 5 machines I, II, III, IV and V. The time in minutes the worker requires to complete job on various machines is as in following table **07**

		Machines				
		I	II	III	IV	V
Worker	A	170	140	185	200	210
	B	145	130	140	170	185
	C	150	120	165	180	195
	D	60	60	90	90	120
	E	65	45	80	90	115

If each worker has to be given job on one separate machine, determine the optimal assignment to minimize the total time and find this minimum total time of all workers

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