Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

MCA– SEMESTER –IV EXAMINATION –SUMMER-2019

Subject Code:3640009 **Date: 21-05-2019**

Subject Name: Operations Research

Time:10.30 am to 1.00 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)** What is Operations Research (OR)? Sate any four application of OR. **07**

(b) The one company refuse department runs two recycling centers. Center 1 costs Rs.40 to run for an eight hour day. In a typical day 140 pounds of glass and 60 pounds of aluminum are deposited at Center 1. Center 2 costs Rs.50 for an eight-hour day, with 100 pounds of glass and 180 pounds of aluminum deposited per day. The county has a commitment to deliver at least 1540 pounds of glass and 1440 pounds of aluminum per week to encourage a recycler to open up a plant in town. How many days per week should the county open each center to minimize its cost and still meet the recycler's needs? Formulate this problem as an LP Problem? **07**

Q.2 **(a)** **(i)** Use graphical method to solve following LPP: **04**

$$\text{Maximize } Z = 50x + 18y$$
$$\text{Sub. to } 2x + y \leq 100$$
$$x + y \leq 80$$
$$x \geq 0, y \geq 0$$

(ii) (a) Slack Variable (b) Surplus Variable (c) Artificial variable **03**

(b) Solve the following LPP using Simplex method **07**

$$\text{Maximize } Z = 30x_1 + 40x_2 + 20x_3$$
$$\text{Sub. to } 10x_1 + 12x_2 + 7x_3 \leq 10{,}000$$
$$7x_1 + 10x_2 + 8x_3 \leq 8{,}000$$
$$x_1 + x_2 + x3 \leq 1{,}000$$
$$x_1, x_2, x_3 \geq 0$$

OR

(b) Use Big –M method to solve the following LP Problem. **07**

$$\text{Minimize } z = 5x_1 + 3x_2$$
$$\text{Sub. to } 2x_1 + 4x_2 \leq 12,$$
$$2x_1 + 2x_2 = 10$$
$$5x_1 + 2x_2 \geq 10$$
$$x_1, x_2 \geq 0$$

Q.3 **(a)** Solve the following Transportation Problem using VAM and obtain an optimal solution to minimize the cost: **07**

	Destination				
	D1	D2	D3	D4	Supply
S1	11	13	17	14	250
S2	16	16	14	10	300
S3	21	24	13	10	400
Demand	200	225	275	250	

(b) Solve the following Assignment problem **07**

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

OR

Q.3 **(a)** State and define the methods of solving an assignment problem **07**

(b) (i) Consider the game with the following payoff table **04**

Player B		
Player A	B1	B2
A1	2	6
A2	-2	λ

(a) Show the game is strictly determinable, whatever λ may be

(b) Determine the value of the game

(ii)Rules to determine saddle point **03**

Q.4 **(a)** The data collected in running a machine, the cost of which is Rs. 1,00,000 are given: **07**

Year	1	2	3	4	5	6
Running Cost	7500	8500	10000	12500	17500	27500
Resale Value	85000	76500	70000	60000	40000	15000
Determine the optimum period of replacement of the machine						

(b) A purchase manager places order each time for a lot of 500 units of a particular item. From the data, the following results are obtained: **07**
Inventory carrying cost = 40%, Ordering cost per order = Rs. 600
Cost per unit = Rs. 50, Annual demand = 1000 units
Find out the loss to the organization due to his ordering policy.

OR

Q.4 **(a)** A contractor has to supply 10000 bearings per day to an automobile manufacturer .he finds that when he starts production run , he can produced 25000 bearings per day. The cost of holdings a bearing in stock for a year is Rs 2 and the setup cost of a production run is Rs 1800 . How frequency should product run be made?(Assume 300 Working Days in a year) **07**

(b) What is Replacement? Explain Types of Failure in detail. **07**

Q.5 **(a)** Briefly explain the structure of Queuing system **07**

(b) we have five jobs, each of which has to be processed on two machines A & B in the order AB. Processing times are given in the following table: **07**

Machine	JOBS				
	1	2	3	4	5
A	6	2	10	4	11
B	3	7	8	9	5

OR

Q.5 **(a)** A television repairman finds that the time spent on his job has an exponential distribution with a mean of 30 minutes. if he repairs the sets in the order in which they came in, and if the arrival of sets follows a Poisson distributions with an approximate average rate of 10 per 8 hours day, what is the repairman's expected idle time for each day? How many jobs are ahead of the average set just brought in? **07**

(b)

Tasks	A	B	C	D	E	F	G	H
Predecessor	-	A	A	B,C	B,C	E	D,F	G
Duration	0	10	20	30	20	40	20	0

07

Draw the network of Project and Find Critical Path

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