Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VII (NEW) EXAMINATION – WINTER 2017

Subject Code: 2171901 **Date: 10/11/2017**

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)** State applications of Operations research. **03**

(b) Discuss the similarity and differences between PERT and CPM. **04**

(c) A diesel engine car whose initial cost is ₹ 30000 having maintenance cost and resale value at the end of different year is tabulated as: **07**

Year	1	2	3	4	5	6
Maintenance cost (₹.)	4500	4700	5000	5500	6500	7500
Resale value (₹.) (% of ini ial Cost)	0.9	0.85	0.80	0.70	0.60	0.55

Find out the average annual cost and suggest the economic life of machine.

Q.2 **(a)** What are the assumptions in LPP **03**

(b) An oil company produces two grade of gasoline P and Q which it sells at ₹ 30 and ₹ 40 per liter. The company can buy four different crude oils with the constituents and cost given as: **04**

Crude oil	Constituents			Price/Lit. ₹
	A	B	C	
1	0.75	0.15	0.10	20.0
2	0.20	0.30	0.50	22.5
3	0.70	0.10	0.20	25.0
4	0.40	0.10	0.50	27.5

Gasoline P must have at least 55% of A and not more than 40% of C, gasoline Q must not more than 25 % of C. formulate the problem to determine the use of crude oil to maximize the profit.

(c) Using graphical method find the Minimum value of **07**

$Z = -x_1 + 2x_2$

Subjects to $-x_1 + 3x_2 \leq 10$,

$x_1 + x_2 \leq 6$,

$x_1 - x_2 \leq 2$,

$x_1, x_2 \geq 0$.

OR

(c) Find the optimum solution for the following transportation problem **07**

		Warehouses				Capacity
		A	B	C	D	
Factories	P	5	2	4	3	12
	Q	4	8	1	6	15
	R	4	6	7	5	18
Requirements		7	12	17	9	

Q.3 **(a)** What is degeneracy in transportation problem? How to resolve such problem? **03**

(b) Is it possible to solve assignment problem using transportation technique? Explain with reason. **04**

(c) Solve the following problem using Big M method **07**

Maximize $Z = 4x + 5y$

Subjects to $2x + 3y \leq 6$,

$3x + y \geq 3$,

$x, y \geq 0$.

OR

Q.3 **(a)** How to tackle the non-square matrix in the assignment problem?. Explain with suitable example. **03**

(b) Write the dual of **04**

Maximize $Z = 3x_1 - x_2 + 5x_3$

Subject to $5x_1 - 2x_2 \leq 6$,

$8x_1 + x_2 + 4x_3 \geq 10$,

$5x_1 - 4x_3 \leq 12$ and

$x_1, x_2, x_3 \geq 0$

(c) Ravi Shastri as a team coach has decided to allot five batting positions to five batsmen using assignment technique. The average runs scored by each batsman at these positions are as follows. **07**

	I	II	III	IV	V
Rahne	40	40	35	25	50
KL Rahul	42	30	16	25	27
Kohli	50	48	40	50	60
Pujara	58	60	59	55	53
Dhavan	45	60	59	55	49
Ashwin	12	19	17	41	46

Assign each batsman to one position which would give the maximum number of runs keeping in mind that *skipper Kohli wants to go at No. 4.*

Q.4 **(a)** What is economic order quantity? **03**

(b) Define Operations research and explain any two area of application feasible in college campus. **04**

(c) A self-service store employs one cashier at its counter. 12 customers arrive on an average every 5 minutes while the cashier can serve 15 customers in 5 minutes. Assuming Poisson distribution for arrival rate and exponential distribution for service rate, find **07**

1. Average number of customers in the system
2. Average number of customers in queue
3. Average time a customer spends in the system
4. Average time a customer waits before being served.

OR

Q.4 **(a)** What is traffic intensity in queuing? **03**

(b) What is saddle point? Find out saddle point for the following game: **04**

	Player B				
		B1	B2	B3	B4
Player A	A1	62	44	55	40
	A2	60	45	48	51
	A3	40	42	30	40

(c) A company uses ₹10000 worth of an item during the year. The ordering costs are ₹ 25 per order and carrying costs are 12.5% of the average inventory value. Find the economic order quantity, number of orders per year, time period per order and the total cost. **07**

Q.5 **(a)** What are the limitations of games theory? **03**

(b) 3 models of mobile launched in market. The sales department workout the pay-off in terms of monthly net sales for each type of sales namely up, neutral, down for these events as tabulated. **04**

Model	Estimated value of sales in 1000 per month		
	Up	Neutral	Down
Nexus	65	55	45
Resurrection	70	60	55
Unicorn	60	40	45

What will be the sales manager's decision on applying Laplace criterion and Maximin criterion?

(c) Tasks A to I constitutes a project in which the precedence relationships are **07**
A < D; A < E; B < F; D < F; C < G; C < H, F < I; G < I.
Time in day for each task is as follows:

Task	A	B	C	D	E	F	G	H	I
Time	8	10	8	10	16	17	18	14	9

Draw the network to represent the project and find out total float of each activity and identify critical path

OR

Q.5 **(a)** Explain in brief characteristic of queuing theory. **03**

(b) Define event, activity, preceder activity, successor activity, dummy activity with respect to CPM/PERT **04**

(c) The following is the pay-off matrix between player X and Y. find the optimal strategies, its frequencies and the value of game. Use rule of dominance and oddment in calculations. **07**

		Player Y			
		A	B	C	D
Player X	I	3	2	4	0
	II	3	4	2	4
	III	4	2	4	0
	IV	0	4	0	8