

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER– VII (New) EXAMINATION – WINTER 2019****Subject Code: 2171901****Date: 28/11/2019****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.

MARKS

- Q.1**
- (a) Define Operations research. Explain any two area of feasible application of OR in your college. **03**
- (b) Briefly explain: Phases of Operation Research. **04**
- (c) Tom has received certain amount as will from his maternal parents. He is contemplating how much money he should invest in various alternatives open to him so as to maximize return on investment. The investment alternatives are given below with his subjective estimate of the risk involved on a five – point scale. He decided that the risk should not be more than 4 and the fund should not be locked up for more than 15 years. He would necessarily invest at least 25% in house construction. Formulate the LPP: **07**

Alternatives	Return	No. of Years	Risk
Govt. Securities	6	15	1
Company deposits	13	3	3
Time deposits	10	5	2
Equity Shares	20	6	5
Construction business	25	10	1

- Q.2**
- (a) What are the characteristics of Linear Programming Problems? Discuss. **03**
- (b) Solve problem using graphical method: **04**

$$\begin{aligned}
 \text{Max } Z &= 20x_1 + 30x_2 \\
 \text{Subject to } 2x_1 + 3x_2 &\geq 120 \\
 x_1 + x_2 &\leq 40 \\
 2x_1 + 1.5x_2 &\geq 90 \\
 x_1, x_2 &\geq 0
 \end{aligned}$$

- (c) Solve the following problem using simplex method: **07**
- Minimize $Z = x_1 - 3x_2 + 2x_3$
- Subject to $3x_1 - x_2 + 2x_3 \leq 7$
- $$\begin{aligned}
 -2x_1 + 4x_2 + 2x_3 &\leq 12 \\
 -4x_1 + 3x_2 + 8x_3 &\leq 10 \\
 x_1, x_2, x_3 &\geq 0
 \end{aligned}$$

OR

- (c) Develop dual problem and solve the same:
 $\text{Max } Z = 40x_1 + 50x_2$
 Subject to $2x_1 + 3x_2 \leq 3$
 $8x_1 + 4x_2 \leq 5$
 $x_1, x_2 \geq 0$

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Also, find out the result of primal from final table of dual.

- Q.3 (a) How profit maximization problem can be solved by assignment Problem? 03
- (b) A bank has only one cashier. Cashier working style follows Poisson distribution with mean service rate of 8 customer per hour. The customer arrives at a rate of 5 per hour during entire 8 hours. Find out:
 i. Equipment utilization
 ii. The percentage time that an arriving customer has to wait.
 iii. Average system time. 04
- (c) Solve the minimal assignment problem whose matrix as follows: 07
 Also find the other optimal solution, if any.

	1	2	3	4
I	2	3	4	5
II	4	5	6	7
III	7	8	9	8
IV	3	5	8	4

OR

- Q.3 (a) How to tackle the non-square matrix in the assignment problem? Explain with suitable example. 03
- (b) Explain: Kendall's Notation in terms of Queuing Theory 04
- (c) Find out the optimum transportation cost based on given table: 07

		1	2	3	4	
Supply	A	4	6	8	13	50
	B	13	11	10	8	70
	C	14	4	10	13	30
	D	9	11	13	8	50
Demand →		25	35	105	20	

- Q.4 (a) Explain: Procedure for Group Replacement Theory 03
- (b) Derive the equation for Economic Order Quantity (EOQ) for constant demand with the condition of no shortage. 04
- (c) The initial price of an equilibrium is Rs. 5000. The running cost varies as below: 07

Year	1	2	3	4	5	6	7
Running Cost	400	500	700	1000	1300	1700	2100

Taking a discount rate of 0.90, find out the optimum replacement interval.

OR

- Q.4 (a) Discuss different types of costs associated with inventory. 03
- (b) Explain: ABC analysis and its importance. 04

- (c) Reduce the following game by dominance and find the value of the game. 07

		Player B			
		I	II	III	IV
Player A	I	3	2	4	0
	II	3	4	2	4
	III	4	2	4	0
	IV	0	4	0	8

- Q.5** (a) Explain the concept of 'Expected Value of Perfect Information' in context of Decision theory. 03
- (b) Differentiate: PERT and CPM. 04
- (c) XYZ company is currently working with a process which fetches profit of Rs. 12000. The following alternatives are available to the company: 07
- Do research R1 having success probability of 90% which costs Rs. 10,000 and if it proves successful it can add gross income of Rs. 25000.
 - Do research R2 having success probability of 60% which costs Rs. 8,000 and if it proves successful it can add gross income of Rs. 25000.
 - Pay royalty of Rs. 6000 to third party which can bring gross income of Rs. 20000.
 - The company continues the current process.

Because of limited resources, it is assumed that company can for only one type of research at a time. Use decision tree analysis to find out optimal strategy.

OR

- Q.5** (a) Discuss the conditions under which crashing of project is necessary. Also discuss its effect on the project cost. 03
- (b) Explain steps for decision theory approach. 04
- (c) A small project is composed of following activities whose time estimates are listed below: 07

Activity	Estimated time Duration (in Weeks)		
	Optimistic	Most Likely	Pessimistic
1-2	1	1	7
1-3	1	4	7
1-4	2	2	8
2-5	1	1	1
3-5	2	5	14
4-6	2	5	8
5-6	3	6	15

- Draw the project network.
- Find the expected duration and variance of each activity.
- Calculate early and late occurrence of each event.
