

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER-VII(NEW) EXAMINATION – SUMMER 2019

Subject Code:2171901

Date:16/05/2019

Subject Name:Operation 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.

MARKS

Q.1 (a) Write applications of operation research.

03

(b) Differentiate CPM & PERT.

04

(c) Using graphical method to solve the LPP

07

$$\text{Max } Z=3x_1+4x_2$$

Subjected to,

$$1) 5x_1+4x_2 \leq 200,$$

$$2) 3x_1+5x_2 \leq 150,$$

$$3) 5x_1+4x_2 \geq 100$$

$$4) 8x_1+4x_2 \geq 80$$

$$x_1 \text{ \& } x_2 \geq 0$$

Q.2 (a) Construct the dual of following prime problem

03

$$\text{Maximize } Z = 3x_1 - x_2 + x_3$$

Subject to constraints,

$$4x_1 - x_2 \leq 8, 8x_1 + x_2 + 3x_3 \leq 8,$$

$$5x_1 - 6x_3 \leq 12,$$

$$x_1, x_2, x_3 \geq 0$$

(b) A company is manufacturing two different types of products, A and B. Each product has to be processed on two machines M_1 and M_2 . Product A requires 2 hours on machine M_1 and 1 hour on machine M_2 , Product B requires 1 hours on machine M_1 and 2 hour on machine M_2 . The available capacity of machine M_1 is 104 hours and that of machine M_2 is 76 hours. Profit per unit for product A is Rs.6 and that for B is Rs.11. Formulate the problem.

04

(c) Solve the following LPP by simplex method.

07

$$\text{Maximize } Z = 40x_1 + 35x_2$$

$$\text{Subjected to } 2x_1 + 3x_2 \leq 60$$

$$4x_1 + 3x_2 \leq 96$$

$$x_1, x_2 \geq 0$$

OR

(c) Solve the following LPP by simplex method

07

$$\text{Maximize } Z = 3x_1 + 2x_2$$

$$\text{Subjected to } 2x_1 + x_2 \leq 40$$

$$2x_1 + 3x_2 \leq 60$$

$$x_1 + x_2 \leq 24$$

$$x_1, x_2 \geq 0$$

Q.3 (a) Draw the network diagram for given relationship of activities. 07

Activity	A	B	C	D	E	F	G	H
Predecessor	-	-	A	B	B	C	D	E,F,G

(b) The maintenance cost and resale value per year of a machine whose purchase price is Rs.7000 is given below. When should machine be replaced. 07

Year	1	2	3	4	5	6	7	8
Maintenance cost (Rs)	900	1200	1600	2100	2800	3700	4700	5900
Resale value cost (Rs)	4000	2000	1200	600	500	400	400	400

OR

Q.3 (a) Solve the following pay-off matrix for player A. Also find out the optimal strategies and value of the game. 07

		Player B		
		B1	B2	B3
Player A	A1	275	-50	-75
A	A2	125	130	150

(b) Determine the critical path and project duration for given activities. 07

Activity	A	B	C	D	E	F	G
Predecessor activity	-	A	A	A	B,C	C,D	E,F
Duration(Days)	10	5	4	7	6	4	7

Q.4 (a) What is assignment problem? Show the assignment problem is special case of transportation problem. 03

(b) Describe the various steps in Hungarian method used for solving the assignment problem. 04

(c) For Asia cup Rohit Sharma as a captain of india has to allot five middle batting positions to five batsmen. The average runs scored by each batsman at these positions are as follows. 07

Batting Position → Batsman ↓	I	II	III	IV	V
Rayudu	40	40	35	25	50
Dhoni	42	30	16	25	27
Rohit	50	48	40	60	50
Karthik	20	19	20	18	25
Dhawan	58	60	59	55	53

Find the assignments to batsmen position which would give maximum number of runs and which will help to get the Asia cup.

(OR)

Q.4 (a) What is degeneracy in transportation problem? 03

Q.4 (b) The paper manufacturing company has three warehouses located in three different areas A, B, C. The company has to send from these warehouse to three destinations, says D,E, and F. The availability from warehouse A,B and C and demand at D,E and F is given in following table. Find out basic feasible solution.(Use any method) 04

		Destinations			Supply
		D	E	F	
Source	A	4	5	1	40
	B	3	4	3	60
	C	6	2	8	70
Demand		70	40	60	

- Q.4 (c)** Find the optimal solution of the following Transportation problem using MODI method. Use VAM to find IBFS. **07**

		Destinations				Supply
		M1	M2	M3	M4	
Source	A	3	2	4	1	20
	B	2	4	5	3	15
	C	3	5	2	6	25
	D	4	3	1	4	40
Demand		30	20	25	25	

- Q.5 (a)** What is inventory? Classify the inventory. **03**

- (b) Explain the different methods useful for decision making under certainty. **04**

- (c) The annual demand for an item is 3200 units. The unit cost is Rs.6 and inventory carrying charges 25 % per annum. If the cost of one procurement is Rs.150, then determine the 1) EOQ 2) No. of order per year 3) Time between two consecutive order 4) The optimal cost. **07**

OR

- Q.5 (a)** Define the following terms relating the customer's behavior in Queue. **03**
 a) Balking b) Jockeying c) Reneging

- (b) Write a short note on "ABC analysis" of inventory control technique. **04**

- (c) Customers arrive at one person barber shop according to Poisson process with a mean inter-arrival time 20 minutes. Customer spends on an average of 15 minutes in barber's chair. **07**

- 1) What is the probability that new arrival need not wait for the barber to be free?
- 2) What is the expected number of customers in barber shop?
- 3) How much time can a customer expect to wait for his turn?
- 4) How much time can a customer spend in the shop?
- 5) Management will put in another chair and hire another barber when customer's average time in shop exceeds 1.25 hours. How much must average rate of arrival increase to warrant a second barber.
