Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VII EXAMINATION – SUMMER 2016

Subject Code:171901 **Date:16/05/2016**

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.**

Q.1 **(a)** Write the applications of operation research. **07**

(b) Write the difference between primal and dual in case of linear programming problem. **07**

Q.2 **(a)** A factory uses three machines to produce two machine parts. The following table represents the machining time for each part and other related information. Find the number of parts to be manufactured per week to maximize the profit. Comment on the obtained solution. **07**

Machine	Time for machining (min.)		Max. time available per week
	Part I	Part II	
Lathe	12	6	3000
Milling	4	10	2000
Grinding	2	3	900
Profit /unit (Rs.)	40	100	

(b) The transportation costs incurred to the four factories (P, Q, R & S) and their capacities are as shown in table. The production costs to them are Rs. 2, 3, 1 and 5 respectively. Whereas, demands of market A, B, C, D are 25, 35, 105, 20 respectively. Propose the deliveries from each of factories to each market so the total production and transportation cost is the minimum. Use VAM and MODI methods. **07**

	A	B	C	D	capacity
P	2	4	6	11	50
Q	10	8	7	5	70
R	13	3	9	12	30
S	4	6	8	13	50

OR

(b) Solve following LPP by simplex method only and comments on your special observations if any. **07**

Maximize Z = $2X_1 + X_2$

Subject to constraints: $4X_1 + 3X_2 \leq 12$, $4X_1 + X_2 \leq 8$, $4X_1 - X_2 \leq 8$, $X_1, X_2 \geq 0$.

Q.3 **(a)** The following is the cost matrix of assigning the 4 operators to 4 jobs. Each operator is assigned only one job so as to minimize the total cost of jobs. What will be the total minimum job cost? **07**

Operators	Job			
	J1	J2	J3	J4
O1	2	10	9	7
O2	15	4	14	8
O3	13	14	16	11
O4	4	15	13	9

(b) Define: Pay off, Value of game, Saddle point **07**

OR

Q.3 **(a)** Write the canonical form of assignment model and compare with the transportation model. **07**

(b) From the following survival table, calculate the probability of staff resignation in each year. **07**

Year	0	1	2	3	4	5	6	7	8	9	10
No. of original staff in service at end of year.	1000	940	820	580	400	280	190	130	70	30	0

Q.4 **(a)** Cars arrive at service station every 15 minutes and the service time is 33 minutes. If the line capacity of service station is limited to 5 cars then find the probability that the service station is empty and the average number of cars in the system. **07**

(b) Draw a network for following project; **07**

Activity	A	B	C	E	F	G	H	I	J	K
predecessor	-	-	-	A	A,B	B,C	C	E,F	G,H	H

OR

Q.4 **(a)** A company uses fixed order quantity inventory system. The annual demand of the item is 20000 units. The cost per unit is Rs. 15 and ordering cost is Rs 200 per production run. The holding cost is 22% of cost of unit. Lead time in the past has been 10, 12, 20, 25, 28 days. Calculate safety stock, reorder level and average level of inventory. **07**

(b) Define: Event, Dummy activity, Free float **07**

Q.5 **(a)** Enlist the advantages and limitations of simulation **07**

(b) Write the characteristics of dynamic programming. **07**

OR

Q.5 **(a)** Explain steps in Monte Carlo simulation process. **07**

(b) Explain the Bellman's Principle of optimality with illustrative example. **07**

****