Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

MCA - SEMESTER–IV EXAMINATION – WINTER 2018

Subject Code: 3640009 **Date: 27/11/2018**

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)** Define Operations Research. List out Applications of Operations Research. **07**

(b) A company has two plants, each of which produces and supplies two products: A and B. The plants can each work up to 16 hours a day. In plant 1, it takes three hours to prepare and pack 1000 gallons of A and one hour to prepare and pack one quintal of B. In plant 2, it takes two hours to prepare and pack 1000 gallons of A and 1.5 hours to prepare and pack a quintal of B. In plant 1, it costs Rs 15000 to prepare and pack 1000 gallons of A and Rs 28000 to prepare and pack a quintal of B, whereas in plant 2 these costs are Rs 18000 and Rs 26000, respectively. The company is obliged to produce daily at least 10 thousand gallons of A and 8 quintals of B. Formulate this problem as an LP model so as to minimize total cost of the company. **07**

Q.2 **(a)** Use the graphical method to solve the following LP problem. **07**

Maximize $Z = 15x + 10y$

Subject to the constraints,

(i) $4x + 6y \leq 360$ (ii) $3x \leq 180$ (iii) $5y \leq 200$

And $x, y \geq 0$

(b) Write down the steps of simplex method to solve the LP problem. **07**

OR

(b) Write the dual of the following primal LP problem: **07**

Minimize $Z = x_1 + 2x_2$

Subject to the constraints,

(i) $2x_1 + 4x_2 \leq 160$ (ii) $x_1 - x_2 = 30$ (iii) $x_1 \geq 10$

and $x_1, x_2 \geq 0$

Q.3 **(a)** Find the initial basic feasible solution for the following transportation problem using NWCM and LCM method: **07**

	D1	**D2**	**D3**	**D4**	**Supply**
S1	19	30	50	10	7
S2	70	30	40	60	9
S3	40	8	70	20	18
Demand	5	8	7	14	34

(b) For the game with payoff matrix: **07**

	Player B		
Player A	B1	B2	B3
A1	-1	2	-2
A2	6	4	-6

Determine the optimal strategies for player A and B. Also determine the value of game. Is this game (i) fair? (ii) Strictly determinable?

OR

Q.3 **(a)** A department of company has five employees with five jobs to be performed. The time (in hours) that each man takes to perform each job is given in the effectiveness matrix. **07**

		Employees				
		I	**II**	**III**	**IV**	**V**
Jobs	**A**	10	5	13	15	16
	B	3	9	18	13	6
	C	10	7	2	2	2
	D	7	11	9	7	12
	E	7	9	10	4	12

How should the jobs be allocated, one per employee, so as to minimize the total man-hours?

(b) Explain the structure of a Queuing System. **07**

Q.4 **(a)** The production department of a company requires 3,600 kg of raw material for manufacturing a particular item per year. It has been estimated that the cost of placing an order is Rs 36 and the cost of carrying inventory is 25 per cent of the investment in the inventories. The price is Rs 10 per kg. Help the purchase manager to determine an ordering policy for raw material. **07**

(b) The data collected in running a machine, the cost of which is Rs 60000, are given below: **07**

Year	1	2	3	4	5
Resale Value	42000	30000	20400	14400	9650
Cost of spares (Rs)	4000	4270	4880	5700	6800
Cost of labor (Rs)	14000	16000	18000	21000	25000

Determine the optimum period for replacement of the machines.

OR

Q.4 **(a)** Write down the steps of Simulation process. **07**

(b) Listed in the table are the activities and sequencing necessary for a maintenance job on the heat exchangers in a refinery. **07**

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

Draw a network diagram of activities for the project.

Q.5 **(a)** Find the sequence that minimizes the total time required in performing the following jobs on three machines in the order ABC. Processing times (in hours) are given in the following table: **07**

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

(b) Explain the different inventory cost components. **07**

OR

Q.5 **(a)** A book binder has one printing press, one binding machine and manuscripts of 7 different books. The times required for performing printing and binding operations for different books are shown below: **07**

Book	1	2	3	4	5	6	7
Printing time	20	90	80	20	120	15	65
Binding time	25	60	75	30	90	35	50

(b) Decide the optimum sequence of processing of books in order to minimize the total time required to bring out all the books.

1) Define Events. Explain the types of Events. **03**

2) Define Activities. Explain the types of Activities. **04**

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