Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

MCA INTEGRATED – SEMESTER – IV EXAMINATION – WINTER – 2016

Subject Code: 4440602

Subject Name: Operations Research **Date:19/11/ 2016**

Time:02.30 pm to 5.00 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)** What is Linear Programming? Explain the basic components of an LP model and also state its assumptions. **07**

(b) What is operation Research? Explain its features. **07**

Q.2 **(a)** Solve the following LP problem using Graphical method: **07**

Maximize $Z = 10x_1 + 15x_2$

Subject to the constraints 1) $2x_1 + x_2 \leq 26$

2) $2x_1 + 4x_2 \leq 26$

3) $-x_1 + x_2 \leq 5$

And $x_1, x_2 \geq 0$.

(b) Solve the following LP problem using Simplex method: **07**

Maximize $Z = 5x_1 + 3x_2$

Subject to the constraints 1) $x_1 + x_2 \leq 2$

2) $5x_1 + 2x_2 \leq 10$

3) $3x_1 + 8x_2 \leq 12$

And $x_1 , x_2 \geq 0$.

OR

(b) Solve the following LP problem using Big-M method: **07**

Maximize $Z = 2x_1 + 4x_2$

Subject to the constraints 1) $2x_1 + x_2 \leq 18$

2) $3x_1 + 2x_2 \geq 30$

3) $x_1 + 2x_2 = 26$

And $x_1 , x_2 \geq 0$.

Q.3 **(a)** Discuss the various types of inventories in detail. **07**

(b) An appliance manufacturer produces two models of microwave ovens, H and W. Both models require fabrication and assembly work; each H uses four hours of fabrication and two hours of assembly and each W uses two hours of fabrication and six hours of assembly. There are 600 fabrication hours available this week and 480 hours of assembly. Each H contributes 400 to profits and each W contributes 300 to profits. Formulate a linear programming model to determine the optimum production mix of H and W models that will maximize profits and also obtain dual of the LP problem. **07**

OR

Q.3 **(a)** Find the initial basic feasible solution of the following transportation problem by Vogel's approximation method. The availability at the factories, the requirement of the warehouses and the various associated unit transportation cost are presented in the following table: **07**

Factory	Warehouses				Available
	W_1	W_2	W_3	W_4	
F_1	19	30	50	10	7
F_2	70	30	40	60	9
F_3	40	8	70	20	18
Requirement	5	8	7	14	34

(b) Consider the problem of assigning five operators to five machines. The assignment costs are given below. **07**

		Operators				
		I	II	III	IV	V
Machines	A	20	22	35	22	18
	B	4	26	24	24	7
	C	23	14	17	19	19
	D	17	15	16	18	15
	E	16	19	21	19	25

Assign the operators to different machines so that total cost is minimized.

Q.4 **(a)** Self-help canteen employs one cashier at its counter, 8 customer arrives every 10 minutes on an average. The cashier can serve at the rate of one customer per minute. Assume Poisson's distribution for arrival and exponential distribution for service patterns. **07**

Determine:

(i) The average number of customers in the system.

(ii) The average queue length.

(iii)The average time customer spends in the system.

(b) What is Simulation? What are the advantages and disadvantages of Simulations? **07**

OR

Q.4 **(a)** What is a Queuing problem? What are the components of a queuing system? **07**

(b) Define: Two-person Zero-sum game, Saddle point **07**

For the game with payoff matrix:

Player A	Player B			
	B1	B2	B3	B4
A1	3	-5	0	6
A2	-4	-2	1	2
A3	5	4	2	3

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

Q.5 **(a)** A manufacturer requires 15000 units of a part annually for assembly. Manufacturer can produce this at the rate of 100 per day. Set-up cost for each production run is Rs. 24.To hold one unit of this part, inventory cost of manufacturer is Rs. 5 for a year. Assume 250 working days per year. Find out the economic batch quantity and economic run length. **07**

(b) Given the following information: **07**

Activity	Duration (in days)
0-1	2
1-2	8
1-3	10
2-4	6
2-5	3
3-4	3
3-6	7
4-7	5
5-7	2
6-7	8

(a) Draw the arrow diagram.
(b) Identify the critical path and find the total project duration.
(c) Calculate total, free and independent floats.

OR

Q.5 **(a)** A book binder has one printing press, one binding machine and manuscripts of a number of books. The time required for performing the printing and binding operations on each book are shown below. The binder wishes to determine the order in which the book should be processed, so that the total time required to process all books is minimized. **07**

Book	1	2	3	4	5	6
Printing time (Hr)	30	120	50	20	90	110
Binding time (Hr)	80	100	90	60	30	10

(b) The initial cost of a machine is Rs 15,000 and maintenance or running costs which increases with age of the machine are given below: **07**

Year	Running Cost (in Rs)
1	2,500
2	3,000
3	4,000
4	5,000
5	6,500
6	8,000
7	10,000

What is the optimal replacement policy if there is no salvage value?

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