Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

MCA - SEMESTER–IV • EXAMINATION – SUMMER • 2015

Subject Code: 640003 Date: 15-05-2015

Subject Name: Operations Research (OR)

Time: 10:30 am - 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.**

Q.1 **(a)** What is Operations Research (OR)? What are the significant features of OR? State any four application of OR. **07**

(b) An electronic company is engaged in the production of two components C_1 and C_2 that are used in radio sets. Each unit of C_1 costs the company Rs. 5 in wages and Rs. 5 in material, while each of C_2 costs the company Rs. 25 in wages and Rs. 15 in material. The company sells both products on one-period credit terms, but the companyôs labour and material expenses must be paid in cash. The selling price of C_1 is Rs. 30 per unit and of C_2 it is Rs. 70 per unit. Because of the companyôs strong monopoly in these components, it is assumed that the company can sell, at the prevailing prices, as many units as it produces. The companyôs production capacity is, however, limited by two considerations. First, at the beginning of period 1, the company has an initial balance of Rs. 4000. Second, the company has available in each period 2000 hours of machine time and 1400 hours of assembly time. The production of each C_1 requires 3 hours of machine time and 2 hours of assembly time, whereas, the production of each C_2 requires 2 hours of machine time and 3 hours of assembly time. **07**

Formulate this problem as an LP model so as to maximize the total profit to the company.(DO NOT SOLVE)

Q.2 **(a)** Obtain the dual of the following primal LP problem **07**

Maximize $Z = 2x_1 + x_2$

subject to the constraints

$x_1 + 5x_2 \geq 10$

$x_1 + 3x_2 \leq 6$

$2x_1 + 2x_2 \geq 8$ and $x_2 \leq 0$, x_1 unrestricted.

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

Maximize $Z = 5x_1 + 3x_2$ subject to the constraints

$x_1 + x_2 \geq 2$

$5x_1 + 2x_2 \geq 10$

$3x_1 + 8x_2 \geq 12$

and $x_1, x_2 \leq 0$.

OR

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

$Max_z = 3x_1 - x_2$
Subject to the constraints
(i) $2x_1 + x_2 \geq 2$, (ii) $x_1 + 3x_2 \leq 3$, (iii) $x_2 \geq 4$
Where $x_1, x_2 \geq 0$

Q.3 **(a)** Solve the following assignment problem and minimize the time: **07**

	1	2	3	4	5
A	32	38	40	28	40
B	40	24	28	21	36
C	41	27	33	30	37
D	22	38	41	36	36
E	29	33	40	35	39

(b) Find initial basic feasible solution for the given transportation problem using (1) least cost method and (2) vogelôs method. **07**

Origins/desti.	D_1	D_2	D_3	D_4	Supply
O_1	19	30	50	10	7
O_2	70	30	40	60	9
O_3	40	8	70	20	18
Demand	5	8	7	14	34

OR

Q.3 **(a)** Explain Hugarian Method for assignment problem. **07**

(b) Define: Two- person zero- sum game, Saddle point. For the game with payoff matrix: **07**

Player A	Player B			
	B_1	B_2	B_3	B_4
A_1	3	ī 5	0	6
A_2	ī 4	ī 2	1	2
A_3	5	4	2	3

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

Q.4 **(a)** Define: Simulation. State the advantages and disadvantages of simulation. **07**

(b) Customers arrives at a box office window, being manned by a single individual, according to a Poisson input process with a mean rate of 30 per hour. The time required to serve a customer has an exponential distribution with a mean of 90 seconds. Find the average waiting time of a customer. Also, determine the average number of customers in the system and the average queue length. **07**

OR

Q.4 **(a)** Describe the characteristics of Calling Population (input source) of a Queuing System. What do you understand by Queue Discipline? **07**

(b) The data collected in running a machine, the cost of which is Rs. 60,000 are given below: **07**

Year	1	2	3	4	5
Resale value (Rs)	42,000	30,000	20,400	14,400	9,650
Cost of spares	4,000	4,270	4,880	5,700	6,800
Cost of labour (Rs.)	14,000	16,000	18,000	21,000	25,000

Determine the optimum period of replacement of the machine.

Q.5 **(a)** What are Inventory Models? Clearly explain with suitable examples. **07**

(b) XYZ manufacturing company processes 6 different jobs on two machines. Find the optimum sequence, the total minimum elapsed time and idle time for each machine. **07**

Machine	jobs					
	J_1	J_2	J_3	J_4	J_5	J_6
M_1	1	5	8	7	3	3
M_2	5	6	5	2	2	10

OR

Q.5 **(a)** Given the following information: **07**

Activity	Duration (in days)	Activity	Duration (in days)
1ī 3	2	3ī 4	10
1ī 4	13	4ī 9	6
2ī 6	9	7ī 8	4
2ī 7	2	8ī 10	10

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

(b) The production department for a company requires 3600 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 % of the investment in the inventories. The price is Rs 10 per kg. The purchase manager wishes to determine an ordering policy for raw material. **07**

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