Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

MCA Integrated - SEMESTER– IV • EXAMINATION – WINTER 2015

Subject Code:4440602 Date:03/12/ 2015

Subject Name: Operation Research (OR)

Time:02:30 p.m. to 5:00 p.m. 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 Operation Research? Explain its features. **07**

(b) A tape recorder company manufactures models A, B and C, which have profit contributions per unit of Rs 15, Rs 40 and Rs 60, respectively. The weekly minimum production requirements are 25 units for model A, 130 units for model B and 55 units for model C. Each type of recorder requires a certain amount of time for the manufacturing of the component parts, for assembling and for packing. Specifically, a dozen units of model A require 4 hours for manufacturing, 3 hours for assembling and 1 hour for packaging. The corresponding figures for a dozen units of model B are 2.5, 4 and 2 and for a dozen units of model C are 6, 9 and 4. During the forthcoming week, the company has available 130 hours of manufacturing, 170 hours of assembling and 52 hours of packaging time. Formulate this problem as an LP model so as to maximize the total profit to the company (Do not solve). **07**

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

Min $Z = 3X_1 + 2X_2$

Subject to: $8X_1 + X_2 \geq 8$

$2X_1 + X_2 \geq 6$

$X_1 + 3X_2 \geq 6$

$X_1 + 3X_2 \geq 8$

$X_1, X_2 \geq 0$

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

Maximize $Z = 10X_1 + 6X_2 + 4X_3$

Subject to: $X_1 + X_2 + X_3 \leq 100$

$10X_1 + 4X_2 + 5X_3 \leq 600$

$2X_1 + 2X_2 + 6X_3 \leq 300$

$X_1, X_2, X_3 \geq 0$

OR

(b) Find the dual of the following Problem: **07**

Minimize $Z = 2X_2 + 5X_3$

Subject to: $X_1 + X_2 \geq 2$

$2X_1 + X_2 + 6X_3 \leq 6$

$X_1 - X_2 + 3X_3 = 4$

$X_1, X_2, X_3 \geq 0$

Q.3 **(a)** Find initial basic feasible solution of the following transportation problem by vogel's Method: **07**

	A	B	C	D	Availability
P	19	30	50	12	7
Q	70	30	40	60	10
R	40	10	60	20	18
Demand	5	8	7	15	

(b) Solve the following assignment problem FOR Minimize cost: **07**

	A	B	C	D	E
P	4	6	7	5	11
Q	7	3	6	9	5
R	8	5	4	6	9
S	9	12	7	11	10
T	7	5	9	8	11

OR

Q.3 **(a)** (I) Explain the following terms: **07**

(i) Strategy (ii) payoff matrix (iii) Value of the game

(II) Find out the saddle point, value of the game for the following pay-off matrix: $\begin{pmatrix} 24 & -10 & -5 \\ 12 & 14 & 7 \\ -15 & -12 & 5 \end{pmatrix}$

(b) Customers arrive at a booking office window being manned by a single individual at a rate of 25 per hour. The time required to serve a customer has exponential distribution with a mean of 120 seconds. Find the average waiting time of a customer. **07**

Q.4 **(a)** Explain Calling population for queuing system. **07**

(b) Given the annual consumption of material is 3600 units, ordering costs are 400 per order. Cost per unit of material is Rs. 64 and carrying cost is 50% of inventory value. Find out EOQ & total cost. **07**

OR

Q.4 **(a)** Explain different types of inventory. **07**

(b) The cost of an equipment is Rs. 124000 and its scrap value is Rs. 4000. The maintenance cost for each year are as given below: **07**

When the equipment should be replaced?

Year	1	2	3	4	5	6	7	8
Main. Cost	2000	4000	7000	10000	16000	22000	32000	48000

Q.5 **(a)** What is simulation? Explain Monte-Carlo simulation along with all the necessary steps. **07** **07**

(b) Five jobs are performed first on machine M_1 and then on machine M_2. Time in hours taken by each job on each machine is given below: **07**

	A	B	C	D	E
M_1	10	2	18	6	20
M_2	4	12	14	16	8

Determine the optimum sequence of jobs and the minimum time elapsed.

OR

Q.5 **(a)** Explain the difference between PERT and CPM. **07**

(b) Draw A network from the following activities and find a critical path and duration of the project. **07**

Activity	Duration(days)
1-2	10
2-3	8
3-4	12
3-5	13
4-6	7
5-6	11
5-7	7
6-8	9
7-8	6
8-9	15
9-10	17

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