Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VII • EXAMINATION – WINTER 2013

Subject Code: 171901 **Date: 26-11-2013**

Subject Name: Operation Research

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 are phases of OR Project, explain in detail **07**

(b) A coffee company mixes Brazilian, Columbian and African coffee to make two brands of coffee plains A and B. The characteristics used in blending the coffee include strength, acidity and caffine. The test result of the available supply of Brazilian, Columbian and African coffee. **07**

	Price/kg	Strength	Acidity	%coffine	Supply available
Brazilian	60	6	4	2	50000
Columbian	70	8	3	2.5	30000
African	65	5	3.5	1.5	25000

The requirement for A and B coffee are given as below.

Plain coffee	Price/kg	Min strength	Max acididty	Max % coffine	Quantity Demanded
A	75	6.5	3.8	2.2	65000
B	85	6.0	3.5	2	55000

Assume that 35000 kg of plains A and 25000 kg of plain B are to be sold formulate LPP.

Q.2 **(a)** Minimize $z = -3x_1 + x_2 - 2x_3$ **07**

Subject to

$x_1 + 3x_2 + x_3 \leq 5$

$2x_1 - x_2 + x_3 \geq 2$

$4x_1 + 3x_2 - 2x_3 = 5$

$x_1, x_2, x_3 \geq 0$

(b) Consider the transportation problem shown in table below **07**

Find the initial basic feasible solution using Northwest corner method

		1	2	3	4	5	supply
PLANT	1	20	4	32	28	20	3000
	2	12	36	24	26	32	5000
	3	16	8	28	24	20	8250
	4	28	44	40	16	36	3750
Demand		3500	4000	2500	1500	4000	

OR

(b) Solve above method by Least cost cell method **07**

Q.3 **(a)** Consider the assignment problem shown in table below. In the problem 5 different jobs are to be assigned to 5 different operators such that the toal processing time is minimized. The matrix entries represent processing times in hours. **07**

Develop a zero-one programming model.

	1	2	3	4	5
1	20	24	30	24	16
2	14	32	28	28	22
3	26	28	14	18	18
4	24	20	22	26	20
5	16	26	30	22	30

(b) Solve above problem with Hungerian method **07**

OR

Q.3 **(a)** Solve the below game theory problem with the concept of dominance method **07**

		PLAYER B			
PLAYER A		I	II	III	IV
	I	3	5	4	2
	II	5	6	2	4
	III	2	1	4	0
	IV	3	3	5	2

(b) Determine the solution of game for the pay-off matrix given below **07**

	PLAYER B			
PLAYER A		I	II	III
	I	-3	-1	7
	II	4	1	-2

Q.4 **(a)** The initial cost of a machine is Rs 71000 and scrape value is Rs 1000. The maintenance costs found from experience are as below. **07**
Find when should the machine be replaced?

Year	1	2	3	4	5	6	7	8
Maintenance	2000	3500	5000	7000	10000	13000	17000	21000

(b) Customers arrive at a one window drive according to the poisons distribution with the mean of 10 minutes and service time per customer is exponential with mean of 6 minutes. The space in front of the window can accommodate only three vehicles including the serviced one. Other vehicles have to wait outside the space. Calculate **07**

- Probability that an arriving customer can drive directly to the space in front of the window
- Probability that an arriving customer will have to wait outside the directed space
- How long an arriving customer is expected to wait before getting the service?

OR

Q.4 **(a)** Inventory control manager of a firm has collected the following data on one item **07**

- Minimum total cost per annum = Rs. 16000
- Inventory holding cost per unit per year = Rs. 4
- No of order per year = 10
- Price per unit = Rs. 25

Calculate annual demand of the item, procurement cost per order, inventory carrying cost as a percentage of average inventory investment and economic order quantity (EOQ)

(b) In a firm, the demand for a certain item is random. It has been established that the monthly demand of an item has a normal distribution with a mean of 1000 and a standard deviation of 150 units. The unit price of an item is Rs 20/-. The ordering cost is Rs 40/-, the inventory carrying cost is estimated to be 15% per **07**

annum respectively. The procurement lead time is constant and is two months. Find the most economic ordering policy and the expected cost of controlling inventory given that the service level is 95%.

Q.5 **(a)** A small project is compsed of 7 activities whose time estimates are listed in the table below. Activities are identified by their beginning (i) and ending (j) node numbers **07**

Activity	Estimated duration (weeks)		
(i-j)	Optimistic	Most likely	pessimistic
1-2	1	1	7
1-3	1	4	7
1-4	2	2	8
2-5	1	1	1
3-5	2	5	14
4-6	2	5	8
5-6	3	6	15

- Draw the network diagram of activities in the project
- Find the expected duration and variance of each activity. What is the expected project length?
- Calculate the variance and standard deviation of the project length.

(b) What do you mean by linear programming? **07**
Define following terms : linear function, objective function, decision variable, constraints, feasible solution, optimal solution.

OR

Q.5 **(a)** What is CPM and PERT. Discuss significance of using CPM and PERT. **07**

(b) Define following terms with respect to CPM/PERT : event, merge event, burst event, activity, processor activity, successor activity, dummy activity **07**

****