(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 2984 **Roll No.** | | | | | | | | | | |

B.Tech.

(SEM. VIII) EVEN THEORY EXAMINATION 2012-13

OPERATIONS RESEARCH

Time : 3 Hours *Total Marks : 100*

Note :– Answer the following **five** questions, choices are within. Marks are indicating therein.

1. Answer any **two** : **(10×2=20)**

(a) The manager of an oil refinery is to decide upon the optimal mix of two possible blending processes, of which the inputs and outputs per production run are as follows :

	Input		Output	
Process	Crude A	Crude B	Gasoline X	Gasoline Y
1	5	3	5	8
2	4	5	4	4

The maximum amount available of crude A and B is 200 units and 150 units respectively. Markets requirements show that at least 100 units of gasoline X and 80 units of gasoline Y must be produced. The profits per production run from process 1 and 2 are Rs. 3 and Rs. 4 respectively. Formulate the problem as a linear programming problem and solve the problem by graphical method.

Consider the following sequence of random numbers.

R. No's : 48, 78, 19, 51, 56, 77, 15, 14, 68, 09. Using this sequence, simulate the demand for the next ten days. Find out the stock situation if the owner of the bakery decides to make 30 cakes every day. Also estimate the daily average demand for the cakes on the basis of simulated data.

(c) What is simulation ? Describe the simulation process. What are the advantages and limitations of simulations ? Also specify the areas where simulation can be used.

5. Answer any **two** : **(10×2=20)**

(a) Explain the Monte-Carlo simulation using an example. Discuss its various applications.

(b) A television repairman finds that the time spent on his jobs has an exponential distribution with a mean of 30 minutes. If he repairs sets in the order in which they came in and if the arrivals of sets follows a Poisson distribution approximately with an average rate of 10 per-8 hour day, what is the repairman's expected idle time each day ? How many jobs are ahead of the average set just brought in ?

subassembly is determined by the bids submitted by each contractor and is shown in table in hundreds of rupees.

Contractors

Subassemblies	1	2	3	4
1	15	13	14	17
2	11	12	15	13
3	13	12	10	11
4	15	17	14	16

(i) Formulate the mathematical model for the assignment problem.

(ii) Assign the different subassemblies to contractors so as to minimize the total cost.

(c) Write brief notes on :

(i) Transportation and assignment problem.

(ii) Hungarians method.

3. Answer any **two** : **(10×2=20)**

(a) Obtain the optimal strategies for both players and the value of the game for two person zero sum game whose pay-off

matrix is as follows :

Player A	Player B	
	B1	B2
A1	1	–3
A2	3	5
A3	–1	6
A4	4	1
A5	2	2
A6	–5	0

(b) A readymade garment manufacturer has to process 6 items through two stages of production, viz, cutting and sewing. The time taken for each of these items at the different stages is given below in appropriate units :

Item	1	2	3	4	5	6
Cutting time	30	120	50	20	90	110
Sewing time	80	100	90	60	30	10

Find the order in which these items are to be processed through these stages so as to minimize the total processing time. Also calculate total elapsed time and idle times.

(c) Explain the Dominance property with reference to game theory. Also write the terminologies of game theory.

4. Answer any **two** : **(10×2=20)**

(a) (i) Define inventory. What are the advantages and disadvantages of having inventories ?

(ii) A stockist has to supply 400 units of a product every Monday to his customers. He gets the product at Rs. 50 per unit from the manufacturer. The cost of ordering and transportation from the manufacturer is Rs. 75 per order. The cost of carrying inventory is 7.5% per year of the cost of the product. Find :

(I) The economic lot size

(II) The total optimal cost (including the capital cost)

(III) The total weekly profit if the item is sold for Rs. 55 per unit.

(b) Bright Bakery keeps stock of a popular brand of cake. Previous experiences indicate the daily demand as given below :

Daily demand	0	10	20	30	40	50
Probability	0.01	0.02	0.15	0.5	0.12	0.02

(b) Maximize $Z = 3x_1 - x_2$

Subject to

$$2x_1 + x_2 \leq 2,$$

$$x_1 + 3x_2 \geq 3,$$

$$x_2 \leq 4,$$

$$x_1, x_2 \geq 0.$$

(c) Define a model. List and describe various types of model used in Operation Research.

2. Answer any **two** : **(10×2=20)**

(a) Solve the Transportation problem for optimum solution :

		Stores						
		1	2	3	4	5	6	Supply
Warehouses	1	9	12	9	6	9	10	5
	2	7	3	7	7	5	5	6
	3	6	5	9	11	3	11	2
	4	6	8	11	2	2	10	9
Demand		4	4	6	2	4	2	

(b) A machine tool company decides to make four subassemblies through four contractors. Each contractor is to receive only one subassembly. The cost of each

(c) The following table lists the jobs of a network along with their time estimates :

	Duration in days		
Jobs	Optimistic	Most likely	Pessimistic
01 to 02	3	6	15
02 to 03	6	12	30
02 to 04	5	11	17
03 to 04	3	9	27
03 to 05	1	4	7
05 to 06	2	5	8
03 to 06	4	19	28
04 to 06	2	5	14

(i) Draw the network and calculate the length and variance of critical path.

(ii) What is the probability that jobs on critical path will be completed by the due date of 40 days ?

(iii) What is your estimate of the probability that the entire project will be completed by the due date ?