YMCA UNIVERSITY OF SCIENCE AND TECHNOLOGY, FARIDABAD

B.TECH. EXAMINATION (under CBS),

Operations Research (MU-408)

Time: 3 hrs.   M. Marks: 60

Note: (i) Part-I is compulsory and consist of short answer type questions.

    (ii) Attempt any four questions from Part-II. All questions carry equal marks.

Part-I

Q1   (i)   Define Operations Research.   10x2

    (ii)   What is shadow price in LPP?

    (iii)   What is duality in LPP?

    (iv)   What is degeneracy in transportation problem?

    (v)   Define EVPI. How is it calculated?

    (vi)   What is a steady state system?

    (vii)   Differentiate between balking and reneging customer behaviour?

    (viii)   What is Laplace criterion in decision analysis?

    (ix)   Distinguish between PERT and CPM.

    (x)   What do you understand by crashing of network?

Part-II

Q2   What are the phases of operations research project? Explain in detail.   10

Q3   A company earns profit of Rs. 25.00 per unit on Product A and Rs. 40.00 per unit on product B. The products are manufactured using leather, wood and glue in the amount given below: 10

Product	Resources required for one unit		
	Leather (in Kg)	Wood (in Sq. Mts.)	Glue (in Lts.)
A	0.50	4	0.2
B	0.25	7	0.2

Available resources include 2200 kgs of leather, 28000 sq. meters of wood and 1400 litres of glue.
    (a) Formulate the above problem as LPP.
    (b) Solve by simplex method and find optimal solution.
    (c) Which resources are fully consumed? How much of each resource remains unutilized?
    (d) What are the shadow prices of resources?

Q4   Arrivals at telephone booth are considered to be Poisson with an average time of 10 min. between one arrival and the next. The length of phone call is assumed to be distributed exponentially with mean 3 min.   10

(a) What is the probability that a person arriving at the booth will have to wait?

(b) What is the average length of the queue that forms from time to time?

(c) What is the average number of customers in the system?

(d) The probability that an arrival finds that four persons are waiting for their turn?

Q5 A manufacturer wants to ship 22 loads of product as shown below. The matrix gives the kilometers from source to destinations.

		Destinations					Supply
		D_1	D_2	D_3	D_4	D_5	
Source	S_1	5	8	6	6	3	8
	S_2	4	7	7	6	5	5
	S_3	8	4	6	6	4	9
Demand		4	4	5	4	8	

Shipping cost is Rs. 10 per load per km. What shipping schedule should be used to minimize total transportation cost?

10

Q6 A project consists of certain activities whose time required for each activity is given in the following table.

Activity	1-2	1-4	1-7	2-3	3-6	4-5	4-8	5-6	6-9	7-9	8-9
Time	2	2	1	4	1	5	8	4	3	3	5

(a) Draw network diagram for the project.

(b) Find the critical path and the project completion time.

(c) Calculate the earliest start and finish time, latest start and finish time for each activity.

(d) Calculate total float, free float and independent float of each activity.

Q7 An automobile company manufactures around 250 bikes. The daily production varies from 246 to 254 depending upon the availability of raw materials and other working conditions:

Production/day: 246 247 248 249 250 251 252 253 254

Probability: 0.05 0.10 0.13 0.15 0.12 0.08 0.20 0.10 0.07

The finished bikes are transported in a specially arranged lorry accommodating 250 bikes. If the bikes are produced more than 250 then the number of bikes which are waiting for dispatch are sent same day by hiring special surface cargo service. Using following random numbers: 79, 80, 75, 74, 63, 42, 17, 25, 9, 11, 64, 67, 68, 60, 56 simulate the process to find out

(a) What will be the average number of bikes waiting in the factory to be sent same day by hiring special surface cargo service?

(b) What will be the average number of empty space on the lorry?