LC-113

April-2014

4th MBA (K.S.) (Integrated)

Quantitative Techniques for Management – II

Time : 3 Hours] **[Max. Marks : 70**

Instructions : (1) Statistical tables will be provided on request.

(2) Non programmable Scientific Calculation can be used.

(3) Write new question on new page.

1. Explain the following : (any **two**) **14**

   (1) What is the difference between basic and applied Research ?

   (2) What are the criteria of Good Research ?

   (3) What are the characteristics of a Good Research Design ? Describe the benefits of Research Design.

2. Solve the following : (any **two**) **14**

   (1) Solve given sequencing problem, giving an optimal solution when passing is not allowed.

Machine	Jobs				
	A	B	C	D	E
M_1	10	12	8	15	16
M_2	3	2	4	1	5
M_3	5	6	4	7	3
M_4	14	7	12	8	10

   (2) A retailer purchases cherries every morning at ₹ 50 a case and sells them for ₹ 80 a case. Any case that remains unsold at the end of the day can be disposed of the next day at a salvage value of ₹ 20 per case (thereafter they have no value). Past sales have ranged from 15 to 18 cases per day. The following is the record of sales for the past 120 days.

Cases sold :	15	16	17	18
Number of days :	12	24	48	36

   Find how many cases should the retailer purchase per day in order to maximize his profit. Also find EVPI.

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(3) Find optimal solution for the given Non Linear Programming problem.

Maximize $Z = 2x_1^2 + 12x_1 x_2 - 7x_2^2$

Subject to $2x_1 + 5x_2 \leq 98$

$x_1, x_2 \geq 0$

3. Solve the following : **14**

(1) An Airline is planning to open a ticket desk at a new shopping complex. staffed by one ticketing agent. Requests for tickets and information takes about 15 per hour on Poisson distribution. At exponential rate service time is assumed to be 3 minutes per request. Find the

    (i) System usage.

    (ii) Percentage of Time agent is idle.

    (iii) Number of customers expected to be waiting to be served.

    (iv) Average time customers will spend in the system.

(2) The management of ABC company is considering the question of marketing a new product. The fixed cost required in the project is ₹ 4,000. Three factors are uncertain, viz., the selling price, variable cost and the annual sales volume. The product has a life of only one year. The management has the data on these three factors as under :

Selling price (₹)	Probability	Variable cost (₹)	Probability	Sales Volume (Units)	Probability
3	0.2	1	0.3	2000	0.3
4	0.5	2	0.6	3000	0.3
5	0.3	3	0.1	5000	0.4

Consider the following sequence of thirty random numbers :

81, 32, 60, 04, 46, 31, 67, 25, 24, 10, 40, 02, 39, 68, 08, 59, 66, 90, 12, 64, 79, 31, 86, 68, 82, 89, 25, 11, 98, 16.

Using the sequence (first 3 random numbers for the first trial etc.). Simulate the average profit for the above project on the basis of 10 trials.

4. Solve the following : (any **two**) **14**

(1) The cost of a machine is ₹ 6,100 and its scrap value is ₹ 100. The maintenance costs found from experience are as follows :

Year :	1	2	3	4	5	6	7	8
Maintenance Cost (₹) :	100	250	400	600	900	1200	1600	2000

When should the machine be replaced ?

(2) The 'School of International Studies' for population' found out, through its survey, that the mobility of the population (in percent) of a stage to a village, town and city is in the following percentages.

To

		Village	Town	City
	Village	50	30	20
From	Town	10	70	20
	City	10	40	50

What will be the proportion of population in village, town and city after two years, given that the present population has proportions of 0.7, 0.2 and 0.1 in the village, town and city, respectively ?

(3) An engineering company is offered a material handling equipment. It is priced at ₹ 60,000 including cost of installation. The costs for operation and maintenance are estimated to be ₹ 10,000 for each of the first five years, increasing every year by ₹ 3,000 in the sixth and subsequent years. The company expects a return of 10 percent on all its investment. What is the optimal replacement period ?

5. Solve the following : (any **two**)   **14**
   (1) The data shown represent two random samples gathered from two populations. Is there sufficient evidence in the data to determine whether the values of population 1 are significantly larger than the values of population 2 ? Use the Mann Whitney U test and $\alpha = 0.01$.

Sample-1:	224,	256,	231,	222,	248,	283,	241,	217,	240,	255,	216,		
Sample 2:	203,	218,	229,	230,	211,	230,	209,	223,	219,	236,	227,	208,	214

(2) A distance network consists of eleven nodes which are distributed as shown in the following table. Find the shortest path from node 1 to node 11 and the corresponding distance using dynamic programming problem algorithm.

Arc	Distance
1 – 2	8
1 – 3	7
1 – 4	1
2 – 5	5
3 – 5	9
3 – 6	2
3 – 7	8
4 – 7	10
5 – 8	12
5 – 9	7
6 – 9	9
7 – 9	6
7 – 10	13
8 – 11	4
9 – 11	2
10 – 11	15

(3) Use the Kruskal-Wallis test to determine whether there is a significant difference in the following groups. Use $\alpha = 0.05$.

Group : 1   19   21   29   22   37   42

Group : 2   30   38   35   24   29

Group : 3   39   32   41   44   30   27   33

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