Seat No. : _____

AB-131

April-2023

Int. M.B.A., Sem.-VIII

Quantitative Techniques for Management – II

Time : 2:30 Hours]   **[Max. Marks : 70**

Instructions : (1)   Graphs and Statistical tables will be providing on request.
                  (2)   Non-programmable scientific calculator can be used.
                  (3)   Attempt new question on new page.

1. Attempt following : (Any **TWO**)   **14**

   (a) Explain different types of inventories in detail.

   (b) A contractor has to supply 10000 bearings per day to an automobile manufacturer. He finds that, when he starts a production run, he can produce 25000 bearings per day. The cost of holding a bearing in stock for one year is 2 paise, and the setup cost of a production run is ₹ 18. What is the optimum lot size and how frequently should production run be made ?

   (c) Find the optimal order quantity for a product for which the price breaks are as follows :

Quantity	Unit cost (in ₹)
0 < Q < 500	10
500 ≤ Q < 750	9.25
750 ≤ Q	8.75

   The monthly demand for the product is 200 units, storage cost is 2% of the unit cost and cost of ordering is ₹ 100.

2. Solve following using appropriate version of simplex algorithm : (Any **TWO**)   **14**

   (a) There are five jobs, each of which is to be processed through three machines A, B and C in order ABC. Processing times in hours are :

Job	A	B	C
J1	3	4	7
J2	8	5	9
J3	7	1	5
J4	5	2	6
J5	4	3	10

   Determine the optimal sequence for the five jobs and the minimum elapsed time.

(b) A large restaurant purchases cakes daily from a local bakery. The cakes cost ₹ 10 each and sell at ₹ 15 each. If the cakes are not sold on the same day, they are sold in another outlet for ₹ 8 each. The relative frequency distribution for the restaurant sales is given below :

Daily Sales (dozens)	30	31	32	33	34	35	36
Probability	0.01	0.09	0.16	0.25	0.30	0.11	0.08

You are required to state :

(i) Optimum quantity which the buyer wants to purchase to maximize the expected profit.

(ii) How much the buyer could afford to pay for perfectly correct information for sales ?

(c) Mr. Sinha had to decide whether or not to drill a well on his farm. In his village, only 40% of the wells drilled were successful at 200 feet of depth. Some of the farmers who did not get water at 200 feet, drilled further up to 250 feet but only 20% struck water at 250 feet. Cost of drilling is ₹ 50 per foot. Mr. Sinha estimated that he would pay ₹ 18000 during a 5 - year period in the present value terms, if he continues to buy water from the neighbour rather than go for the well which would have a life of 5 years. Mr. Sinha has three decisions to make: (a) should he drill up to 200 feet and (b) if no water is found at 200 feet, should he drill up to 250 feet? (c) should he continue to buy water from his neighbour ?

3. Solve following :   **14**

(a) In a bank, cheques are cashed at a single teller counter. Customers arrive at the counter in a Poisson manner at an average rate of 30 customers per hour. The teller takes on an average 90 minutes to cash a cheque. The service time is exponentially distributed :

(i) Calculate the percentage of time the teller is busy.

(ii) Calculate the average time a customer is expected to wait.

(b) An Investment Corporation wants to study the investment projects based on three factors: market demand in units, price per unit minus cost per unit, and the investment required. These factors are felt to be independent of each other. In analyzing a new consumer product, the corporation estimates the following probability distributions :

Annual Demand	Probability	(Price - Cost) per unit in ₹	Probability	Investment Required (₹)	Probability
25000	0.05	3	0.10	2750000	0.25
30000	0.10	5	0.20	3000000	0.50
35000	0.20	7	0.40	3500000	0.25
40000	0.30	9	0.20		
45000	0.20	10	0.10		
50000	0.10				
55000	0.05				

Using simulation process, repeat the trial 10 times. Compute the return on investment for each trial, taking these factors into account. Approximately, what is the highest likely return? Use the following random numbers :

Annual Demand	28	57	60	17	64	20	27	58	61	30
(Price - Cost) per unit	19	07	90	02	57	28	29	83	58	41
Investment Required	18	67	16	71	43	68	47	24	19	97

4. Attempt following : (Any **TWO**)   **14**

   (a) 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 ?

   (b) A machine costs ₹ 500. Operation and maintenance costs are zero for the first year and increase by ₹ 100 every year. If money is worth 5% every year, determine the best age at which the machine should be replaced. The resale value of the machine is negligibly small. What is the weighted average cost of owning and operating the machine ?

   (c) A salesman makes all sales in three cities X, Y and Z only. It is known that he visits each city on a weekly basis and never visits the same city in successive weeks. If he visits city X in a given week, then he visits city Z in the next week. However, if he visits city Y or Z, he is twice as likely to visit city X than the other city. Obtain the transition probability matrix. Also determine the proportionate visits by him to each of the cities in the long run.

5. Solve following : (Any **TWO**)   **14**

   (a) The following data show annual hours missed due to illness for the 24 men and women at the Northern Packing Company, Inc. At 0.10 level of significance, is there any difference attributable to gender ? Use the Mann-Whitney U test.

Men	31	44	25	30	70	63	54	42	36	22	25	50
Women	38	34	33	47	58	83	18	36	41	37	24	48

   (b) Use the Kruskal-Wallis test to determine whether there is a significant difference in the following groups. Use 5% level of significance.

Group 1	19	21	29	22	37	42	
Group 2	30	38	35	24	29		
Group 3	39	32	41	44	30	27	33

(c) A nationwide used-car company has developed a new instructional video to educate salespeople. Twenty employees' average monthly car sales are presented below for time periods both before and after the video's creation. Does the company have enough evidence to conduct 95 percent confidence that the video was effective in increasing the average number of cars sold? If we just consider the employees with low sales (less than an average of 12 cars per month before the video), did the video increase their selling performance?

Before	18.4	16.9	17.4	11.6	10.5	12.7	22.3	18.5	17.5	16.4
After	18.6	16.8	17.3	15.6	19.5	12.6	22.3	16.5	18.0	16.4
Before	15.9	18.6	23.5	18.7	9.4	16.3	18.5	17.4	11.3	8.4
After	17.4	18.6	23.5	18.9	15.6	15.4	17.6	17.4	16.5	13.4

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