Seat No. : _____

AJ-109

April-2025

Int. MBA, Sem.-VIII

Quantitative Techniques for Management - II

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

Note :

(1) Non - Programmable Scientific Calculator can be used.

(2) Statistical Tables will be provided on request.

(3) Attempt new questions on new page.

1. Attempt following. (Any **two**) **14**

(a) What is inventory ? Also mention different types of inventories in detail.

(b) The demand for a commodity is 100 units per day. Every time an order is placed, a fixed cost of ₹ 400 is incurred. The holding cost is ₹ 0.08 per unit per day. If the lead time is 13 days, determine the economic lot size and the reorder point.

(c) A particular item has demand of 9000 units per year. The cost of one procurement is ₹ 100 and the holding cost per unit is ₹ 2.40 per year. The replacement is instantaneous, and shortage cost is ₹ 20 per year. Then determine no of shortages and time between the setups.

2. Attempt following : (Any **two**) **14**

(a) A machine operator has to perform two operations, turning and threading, on a number of different jobs. The requirement to perform these operations (in minutes) for each job is known. Determine the order in which the jobs should be produced to minimize the total time required to turn out all the jobs. Also, find total elapsed time.

Job	Time for Turning (Minutes)	Time for Threading (Minutes)
1	3	8
2	12	10
3	5	9
4	2	6
5	9	3
6	11	1

(b) Find the sequence that minimizes the total time required in performing the following jobs on three machines. Processing time in hours is given in the following table. Also, find total elapsed time.

Job	1	2	3	4	5
Machine A	8	10	6	7	11
Machine B	5	6	2	3	4
Machine C	4	9	8	6	5

(c) A company buys a certain item which sells for ₹ 16 and costs ₹ 12. A tabulation of recent demand for the product appears as follows :

Quantity Sold	80	81	82	83	84	85
Number of Days	24	36	70	30	25	15

What is the Expected Value for Perfect Information (EVPI) ?

3. Attempt following :

(a) Consider a self - service store with one cashier. Assume Poisson arrivals and exponential service times. Suppose that on average nine customers arrive every 5 minutes and that the cashier can serve 10 in 5 minutes. Find **4**

(i) Expected no of customer in the queue.

(ii) Expected number of customers in the system.

(b) A company manufactures 200 motorcycles per day. Depending upon the availability of raw materials and other conditions, the daily production has been varying from 196 motorcycles to 204 motorcycles, whose probability distribution is as given below : **10**

Production/Day	196	197	198	199	200	201	202	203	204
Probability	0.05	0.09	0.12	0.14	0.20	0.15	0.11	0.08	0.06

The motorcycles are transported in a specially designed three storied lorry that can accommodate only 200 motorcycles. Using the following random numbers : 82, 89, 78, 24, 53, 61, 18, 45, 23, 50, 77, 27, 54, 10. Simulate the process to find out :

(i) The average number of motorcycles waiting in the factory

(ii) The average number of empty spaces on the lorry

4. Attempt following. (Any **two**) **14**

(a) A machine shop has a press which is to be replaced as it wears out. A new press is to be installed now. Further, an optimal replacement plan is to be found for the next 7 years after which the press is no longer required. The following data is given :

Year	**Cost of Installing a new Press at the beginning of a year**	**Salvage value at the end of year (₹)**	**Operating cost during the years (₹)**
1	200	100	60
2	210	50	80
3	220	30	100
4	240	20	120
5	260	15	150
6	290	10	180
7	320	0	230

Find optimal replacement policy and the corresponding minimum cost.

(b) A piece of equipment costs ₹ 7500 initially and requires ₹ 400 to be spent on its maintenance in the first year. The maintenance cost would increase by ₹ 500 per year in each of the subsequent years. Determine the optimal replacement of the machine when future costs are discounted at the rate of 10% p.a.

(c) The purchase patterns of the three brands of toothpaste can be expressed as Markov process with the following probabilities :

	Brand X	**Brand Y**	**Brand Z**
Brand X	0.80	0.10	0.10
Brand Y	0.05	0.75	0.20
Brand Z	0.40	0.30	0.30

What is the long run market share ?

5. Attempt following. (Any **two**) **14**

(a) Twenty salespeople of Henley Paper Company have received sales training during the past year. Some were sent to a national program conducted by Salesmasters. The other received training at the company office conducted by the Henley sales manager. Percentages of selling quotas realized by both groups during last year are shown. Mr. Boyden Henley, president, believes that the backgrounds, sales aptitudes, and motivation of both groups are comparable. At the 0.10 level of significance, has either method of training been better ? Use the Mann -Whitney *U* test.

	Percentage of Quota Realized									
Salesmaster	90	95	105	110	100	75	80	90	105	120
Company	80	90	100	120	95	95	90	100	95	105

(b) A mail-order gift company has the following sample data on dollar sales, separated according to how the order was paid. Test the hypothesis that there is no difference in the dollar amount of orders paid for by cash, by check, or by credit card. Use the Kruskal - Wallis test with a 0.05 level of significance.

Credit-card orders	78	64	75	45	82	69	60
Check orders	110	70	53	51	61	68	
Cash orders	90	68	70	54	74	65	59

(c) The following is a table of observed frequencies, along with the frequencies to be expected under a normal distribution :

(i) Calculate the Kolmogorov - Smirnov statistic.

(ii) Can we conclude that these data do in - fact come from a normal distribution ? Use the 0.10 level of significance.

	Test Score				
	51-60	**61-70**	**71-80**	**81-90**	**91 - 100**
Observed Frequency	30	100	440	500	130
Expected Frequency	40	170	500	390	100

Note : Critical values of d in the Kolmogorov - Smirnov goodness - of fit test for $n \geq 35$ at 10% level of significance is $\frac{1.22}{\sqrt{n}}$.