

## Quantitative Analysis for Business Decisions

Time: 3 Hours

Max. Marks: 75

*Answer any FIVE Questions One Question from Each Unit*  
*All Questions Carry Equal Marks. Question 11 is compulsory*

## UNIT-I

1. a How many ways are there to distribute 10 different books among 15 people if no person is to receive more than one book? 6M
- b How many number of arrangements of letters in the word "TALLAHASSEE"? 6M

## OR

2. a If  $A = \begin{bmatrix} -1 & -2 & -2 \\ 2 & 1 & -2 \\ 2 & -2 & 1 \end{bmatrix}$ , find  $A^{-1}$  6M
- b Show that  $\begin{vmatrix} b+c & a & a \\ b & c+a & b \\ c & c & a+b \end{vmatrix} = 4abc$  6M

## UNIT-II

3. a From the data collected during industrial survey, as given in the table below, calculate the variance for the distribution. 6M

Sales level	10	15	20	25	30
Frequency	10	5	15	4	6

- b Calculate Karl Pearson's coefficient of correlation from the following data. 6M

X	2	3	4	5	6
Y	9	6	5	3	2

## OR

4. a A bag contains 20 balls marked with numbers 1 to 20. One ball is drawn at random. Find the probability that it will be a multiple of 2 or 5. 6M
- b A bag contains 10 white and 8 black balls. Two balls are drawn at random one after another without replacement. Find the probability that both the balls drawn are black. 6M

## UNIT-III

5. a Explain clearly the various ingredients of a decision problem. What are the basic steps of a decision-making process? 6M
- b Indicate the difference between decision under risk and decision under uncertainty in statistical decision theory. 6M

## OR

6. The manufacturer of a certain product is considering the purchase of one of three different packaging systems. The product sells for \$10, and the production cost (excluding packaging cost) is \$5 per unit. The cost data for the three packaging systems are: 12M

System No	Purchase cost	Variable cost per unit of product	Scrap value
1	\$100	\$1.50	\$10
2	200	1.00	20
3	400	0.50	40

All three systems last one year only and will then be sold at the listed salvage value. The demand for the product over the year can be regarded as a random variable with the following probability distribution:

Demand, x	Probability, p(x)
100	0.3
200	0.6
400	0.1

Which system should be bought?

#### UNIT-IV

7. a A law firm selects a random sample of 60 electronics stores in a particular area, and asks each of them to repair a compact disc player. In each case the law firm determines whether the store makes unnecessary repairs in order to inflate its bill. The law firm finds that 8 of the stores are guilty of this practice. Obtain a point estimate of the proportion of all such stores in the area that inflate bills in this way. 6M
- b A sample of 100 measurements at breaking strength of cotton thread gave a mean of 7.4 and a standard deviation of 1.2 gms. Find 95% confidence limits for the mean breaking strength of cotton thread. 6M

#### OR

8. a A sample of 64 students has a mean weight of 70 kgs. Can this be regarded as sample from a population with mean weight of 56 kgs. and standard deviation of 25kgs. 6M
- b A random sample of six steel beams has a mean compressive strength of 58392 p.s.i (pounds per square inch) with a S.D of 648 p.s.i. Use this information and the level of significance  $\alpha = 0.05$  to test whether the true average compressive strength of the steel from which this sample came is 58000 p.s.i 6M

#### UNIT-V

9. a Two types of new cars produced in USA are tested for petrol mileage, one sample is consisting of 42 cars averaged 15 kmpl while the other sample consisting of 80 cars averaged 11.5 kmpl with population variances as  $\sigma_1^2 = 2$ ,  $\sigma_2^2 = 1.5$  respectively. Test whether there is any significance difference in the petrol consumption of these two types of cars at 1% level. 6M
- b Random samples of 400 men and 200 women in a locality were asked whether they would like to have a bus stop near their residence. 200 men and 40 women were in favour of the proposal. Test the significance of difference between the two proportions at 5% level. 6M

#### OR

10. a Given the following contingency table for hair colour and eye colour. Find the value of chi-square. Is there good association between two? 12M

		Hair Colour		
Eye Colour		Fair	Brown	Black
	Blue	15	5	20
	Grey	20	10	20
	Brown	25	15	20

- 11 Distribution transformers are arguably the costliest equipment in power distribution. Failed transformers are difficult to replace. Especially, during times of cyclones, floods or other such natural calamities. This causes power outage for a large group of houses or commercial establishments. Therefore, for both cost and reliability considerations, the choice of transformers plays a huge part in a [DISCOM's](#) procurement strategy. A researcher collected the data pertaining to Time Before Failure (TBF) for each manufacturer to arrive at a clear decision and that too for similar rating transformers and similar working conditions. P'Tech has submitted a proposal offering 10% lower price than M'sons. P'Tech has good credentials, but lacks experience. So, if their Mean Time Before Failure (MTBF) is poorer than M'sons, it may result in a higher life cycle cost due to the associated repair requirements. It may also increase customer dissatisfaction since transformer failures result in longer duration power outages for connected consumers. In such a scenario, the 10% upfront cost reduction (due to discount) wouldn't help. On the other hand, if P'Tech has at least the same MTBF as M'sons, the deal would be beneficial to the DISCOM. Hence DISCOM decided to award P'Tech the chance to supply only if they can match (or better) M'sons' performance at a significance level of 5%. Sample data of TBF is given in number of days of operation before failure. Is P'Tech get the order? 15M

<b>Serial Number</b>	<b>TBF of M'sons transformers</b>	<b>TBF of P'tech transformers</b>
1	2,666	2,876
2	3,281	3,219
3	5,533	2,443
4	4,336	3,554
5	3,603	2,559
6	3,774	2,988
7	3,259	2,950
8	3,135	3,066
9	3,227	2,303
10	3,066	3,132
11	2,821	2,044
12	3,270	2,701
13	3,165	3,066
14	2,661	2,292
15	3,446	2,157
16	3,311	3,369
17	2,946	2,070
18	1,832	2,245
19	1,697	3,066
20	3,628	3,384
21	1,690	2,785
22	1,500	3,542
23	3,329	3,121
24	3,493	2,723
25	1,905	2,446
26	1,559	3,380
27	2,365	3,106
28	2,405	2,263
29	3,482	4,612
30	1,511	3,154