

DA-134

December-2017

T.Y., M.B.A., Integrated Quantitative Techniques

Time : 3 Hours]

[Max. Marks : 100

- Instructions :** (1) Graph papers and statistical tables shall be provided on demand.
(2) Non-programmable scientific calculators are permitted.

1. Attempt any **two** : 20

- (a) Explain any two types of sampling procedures :
- (i) Systematic sampling
 - (ii) Cluster sampling
 - (iii) Quota sampling
- (b) (i) A population have 10 observations is divided into two strata. The observations of the first stratum are 4, 7, 11, 12, 16 and the observations of the second stratum are 3, 8, 9, 10, 15. If 2 units are taken at random from each stratum, find the variance of stratified mean.
- (ii) Write a brief note on t-distribution.
- (c) (i) A consumer electronics company wants to determine the job satisfaction levels of its employees. For this, they ask a simple question, are you satisfied with your job ? It was estimated before the study that no more than 30% of the employees would answer yes. What should be the sample size for this company to estimate population proportion to ensure 95% confidence in result and to be within 0.04 of the true population proportion ?
- (ii) A company receives copper plates from a vendor to use as an important part of its machinery. The company had specified that the diameter of the copper plates must be 20 millimetres. Production department of the company has observed that a few of the supplied plates do not meet the specifications. For verifying this, the company researchers have taken a random sample of 20 plates. The sample mean is computed as 20.0105 mm and the sample standard deviation is computed as 0.0592 mm. Construct a 95% confidence interval for estimating the population mean diameter.

- (a) Modern Bicycles has conducted a survey among 100 randomly selected men and 120 randomly selected women. As per the findings, 25 men and 35 women say that the size of the wheel is a very important factor in purchasing a bicycle. On the basis of this data, can the company claim that a significantly higher proportion of women when compared to men believe that the size of wheel is a very important factor ? Take 95% as the confidence level.
- (b) During the economic boom, the average monthly income of software professionals touched ₹ 75,000. A researcher is conducting a study on the impact of economic recession in 2008. The researcher believes that the economic recession may have an adverse impact on the average monthly salary of software professionals. For verifying his belief, the researcher has taken a random sample of 20 software professionals and computed their average income during the recession period. The average income of these 20 professionals is computed as ₹ 60,000. The sample standard deviation is computed as ₹ 3,000. Use $\alpha = 0.10$ to test whether the average income of software professionals is ₹ 75,000 or it has gone down as indicated by the sample mean.
- (c) Random samples drawn from two countries gave the following data relating to the heights of adult males :

	Country A	Country B
Mean height (in inches)	67.42	67.25
Standard deviation (in inches)	2.58	2.50
Number in samples	1000	1200

Is the difference between standard deviations significant ?

- (d) Mega Furniture Ltd. is a leading manufacturer in the furniture industry. It had been using an old advertisement to promote its product. In order to enhance the effectiveness of the advertisement, it makes a few changes to the advertisement. For measuring the effectiveness of the advertisement it has taken a random sample of 8 customers. The scores obtained are as follows :

Scores before the change in advertisement

27 28 26 25 32 31 32 27

Scores after the change in advertisement

26 27 28 30 31 30 32 29

Using 99% as the confidence level, examine whether the advertisement has become more effective after the changes made to it.

- (e) A restaurant owner ranked his 17 waiters in terms of their speed and efficiency on the job. He correlated these ranks with the total amount of tips each of these waiters received for a one-week period. The obtained value of correlation co-efficient is 0.438. What do you conclude at 5% level of significance.

3. Attempt any **two** :

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- (a) The Vice President (sales) of a garment company wants to determine whether sales of the company's brand of jeans is independent of age group. He has appointed a market researcher for this purpose. This marketing researcher has taken a random sample of 703 consumers who have purchased jeans. The researcher conducted survey for three brands of jeans, namely Brand 1, Brand 2 and Brand 3. The researcher has also divided the age group into four categories : 15 to 25, 26 to 35, 36 to 45 and 46 to 55. The observations of the researcher are provided in the table :

Brand Age	Brand 1	Brand 2	Brand 3
15 – 25	65	75	72
26 – 35	60	40	64
36 – 45	45	52	50
46 – 55	55	65	60

Determine whether brand preference is independent of age group. Use $\alpha = 0.05$.

- (b) The table below shows the sales of a company (in thousand rupees) for eight years. Use $\alpha = 0.02$ to determine whether the data fit a uniform distribution :

Year	:	1	2	3	4	5	6	7	8
Sales (in thousand rupees)	:	75	80	73	70	67	82	81	83

- (c) It is believed that the precision (as measured by the variance) of an instrument is no more than 0.16. Carry out the test at 1% level of significance, given 11 measurements of the same subject on the instrument.
2.5, 2.3, 2.4, 2.3, 2.5, 2.7, 2.5, 2.6, 2.6, 2.7, 2.5

4. (a) An automobile manufacturing company wants to launch a new fuel efficient car. For conducting pre-production research, the company has taken random samples from two cities : Nagpur and Nasik. The amount spent on purchasing fuel (in thousand rupees) by 8 families in Nagpur and 10 families in Nasik are given below :

Amount spent on fuel by families (in thousand rupees)

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Nagpur	5	6	4	5	6	5	4	5		
Nasik	3	4	3	2	3	4	1	2	3	4

Let $\alpha = 0.05$, determine whether there is a significant difference in the variance of the amount spent on the purchase of fuel by families in two different cities.

- (b) Vishal Foods Ltd. is a leading manufacturer of biscuits. The company has launched a new brand in the four metros : Delhi, Mumbai, Kolkata and Chennai. After one month, the company realizes that there is a difference in the retail price per pack of biscuits across cities. Before the launch, the company had promised its employees and newly-appointed retailers that the biscuits would be sold at a uniform price in the country. The difference in price can tarnish the image of the company. In order to make a quick inference, the company collected data about the price from six randomly selected stores across the four cities. Based on the sample information, the price per pack of the biscuits (in rupees) is given in the table.

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Price per pack of the biscuits (in rupees)

Delhi	Mumbai	Kolkata	Chennai
22	19	18	21
22.5	19.5	17	20
21.5	19	18.5	21.5
22	20	17	20
22.5	19	18.5	21
21.5	21	17	20

Analyse the significant difference in the prices. Take 95% as the confidence level.

5. Attempt any **two** :

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- (a) A company engaged in the manufacture of wooden sheets has taken a random sample of 25 sheets of 2×2 metre each and examined the number of defects in these sheets. The results are displayed in the table below. Construct a control-chart to examine whether the process is under control :

Wooden Sheets :	1	2	3	4	5	6	7	8	9	10	11	12
No. of defects :	2	3	1	2	3	4	3	2	1	4	2	5

- (b) Explain the terms :
- Producer's Risk
 - Consumer's Risk
 - Operating characteristic curve
 - AOQ
- (c) Suppose that a product is shipped in lots of size $N = 5000$. The receiving inspection procedure used is single sampling with $n = 50$ and $c = 1$. Draw OC curve and ATI curve.