

# Quantitative Analysis

## Question Bank

### MODULE 5: STATISTICAL INFERENCE

1.	Sums on SST, SSR, SSE, and R-squared
2.	Explain Point Estimation
3.	Explain Interval Estimate
4.	Explain the following Properties of Point Estimators 1. Bias 2. Consistency 3. Unbiasedness 4. Efficiency
5.	Explain Moments (method of point estimation)
6.	Explain maximum likelihood (method of point estimation)
7.	A random sample of $n=6$ has the elements 6, 10, 13, 14, 18, 20. Compute a point estimate of 1. Population mean 2. Population standard deviation

### MODULE 6: TESTS OF HYPOTHESES

1.	Explain the concept of hypothesis. What is null hypothesis and alternate hypothesis?
2.	Explain in brief: Type I and Type II errors in hypothesis.
3.	Give the difference between a one tailed test and two tailed test in hypothesis.
5.	A medicine was found to be effective for 9 patients in 8 days on an average with standard deviation of 2.2 days. Another medicine administered to another group of 8 patients was found to be effective in 6 days on an average with standard deviation of 2.6 days. Use 5% level of significance to test the null hypothesis that the two medicines are equally effective.
6.	In a survey of buying habits, 400 women shoppers are chosen at random in supermarket 'A'. Their average weekly food expenditure is Rs. 250 with standard deviation of Rs. 40. For 400 women shoppers chosen at random in supermarket 'B', the average weekly food expenditure is Rs. 220 with standard deviation of Rs. 55. Test at 1% level of significance whether the

	average weekly food expenditure of the two populations of shoppers are equal.
7.	<p>A manufacturer claims that the average life of their electric light bulbs is 2000 hours. A random sample of 64 bulbs is tested and the life, <math>x</math>, in hours recorded. The results obtained are as follows:</p> $\Sigma x = 127\ 808 \quad \Sigma(\bar{x} - x)^2 = 9694.6$ <p>Is there sufficient evidence, at the 1% level, that the manufacturer is over estimating the length of the life of the light bulbs?</p>
8.	To verify whether a course in mathematics improves performance or not, two tests were given to 12 participants, one before and one after the course. Marks of the test paper before the course were 44, 40, 61, 52, 32, 44, 70, 41, 67, 72, 53, 72. Marks of the test after the course were 53, 38, 69, 57, 46, 39, 73, 48, 73, 74, 60, 70. Determine whether the course was useful or not.
9.	The Mean light of a sample of 10 electric bulbs is 1456 hours with a standard deviation of 423 hours. The second sample of 17 electric bulbs chosen from a different batch has a mean of 1280 hours with a standard deviation of 398 hours. Is there a significant difference between the mean of two samples?
10.	For a random sample of 10 persons fed on diet A, the increase in the weight for a certain period was 10, 6, 16, 17, 13, 12, 8, 14, 15, 9 kgs. For another sample of 12 persons fed on diet B, the increase in the weights for the same period was 7, 13, 22, 17, 15, 12, 14, 18, 8, 21, 23, 10 kgs. Test whether the two diets differ significantly as regards to increase in weights.
11.	A random sample is taken and the sample size is 25 The sample is normally distributed, then sample mean is 89 , and the standard deviation is 5.5. Find a 90% confidence interval for the population mean.
12.	What is the 95% confidence interval for population mean of a sample of 81 observation taken from a normal population with standard deviation of 5, if the sample mean is 40?
13.	Ten individuals are chosen at random from a population and their heights are found in inches. The heights are 63, 63, 64, 65, 66, 69, 69, 70, 70, 71. Discuss the suggestion that the mean and height of population is 66. Given for 9 degrees of freedom at 5% level of significance the value of $t$ is 2.262.
14.	A machine is designed to pack edible oil in tins of 5 kgs. A random sample of 10 tins gave the average weight of a tin as 4.8 kg and standard deviation of 2 kg. Is the machine working properly? Given for 9 degrees of freedom at 5% level of significance the value of $t$ is 2.262.
15.	<p>Cardiac patients were implanted pacemakers to control heartbeats. A plastic connector module mounts on top of pacemakers. Assuming standard deviation of 0.0015 inches and normal distribution, find 95% confidence level for mean size of the connector module.</p> <p>A random sample of 75 modules has an average of 0.31 inches. How large a sample is needed if we wish to be 95% confident that the sample mean will be within 0.0005 inches from the true mean?</p>

16.	Compare & Explain Null and Alternative Hypothesis																																										
17	<p>A breeder claims that his variety of cotton contains, at the most, 40 per cent lint in seed cotton. Eighteen samples of 100 grams each were taken, and after ginning the following quantity of lint was found in each sample.</p> <table><tr><td>Sample No. :</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td></tr><tr><td>Quantity of Lint in 100 g sample:</td><td>36.3</td><td>37.0</td><td>36.6</td><td>37.5</td><td>37.5</td><td>37.9</td><td>37.8</td><td>36.9</td><td>36.7</td></tr><tr><td></td><td>10</td><td>11</td><td>12</td><td>13</td><td>14</td><td>15</td><td>16</td><td>17</td><td>18</td></tr><tr><td></td><td>38.5</td><td>37.9</td><td>38.8</td><td>37.5</td><td>37.1</td><td>37.0</td><td>36.3</td><td>36.7</td><td>35.7</td></tr></table> <p>Perform ‘ t’ Test for the hypothesis</p> <p>Note: Value of t tabulated = 2.567 at <math>\alpha = 0.01</math></p>	Sample No. :	1	2	3	4	5	6	7	8	9	Quantity of Lint in 100 g sample:	36.3	37.0	36.6	37.5	37.5	37.9	37.8	36.9	36.7		10	11	12	13	14	15	16	17	18		38.5	37.9	38.8	37.5	37.1	37.0	36.3	36.7	35.7		
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18.	<p>The table below gives the total income in thousand rupees per year of 36 randomly selected persons from a particular class of people.</p> <table><tr><th colspan="6">Income (thousand Rs.)</th></tr><tr><td>6.5</td><td>10.5</td><td>12.7</td><td>13.8</td><td>13.2</td><td>11.4</td></tr><tr><td>5.5</td><td>8.0</td><td>9.6</td><td>9.1</td><td>9.0</td><td>8.5</td></tr><tr><td>4.8</td><td>7.3</td><td>8.4</td><td>8.7</td><td>7.3</td><td>7.4</td></tr><tr><td>5.6</td><td>6.8</td><td>6.9</td><td>6.8</td><td>6.1</td><td>6.5</td></tr><tr><td>4.0</td><td>6.4</td><td>6.4</td><td>8.0</td><td>6.6</td><td>6.2</td></tr><tr><td>4.7</td><td>7.4</td><td>8.0</td><td>8.3</td><td>7.6</td><td>6.7</td></tr></table> <p>On the basis of the sample data, can it be concluded that the mean income of a person in this class of people is Rs. 10,000 per year? Note: Value of z tabulated = 1.96 at <math>\alpha = 0.05</math></p>	Income (thousand Rs.)						6.5	10.5	12.7	13.8	13.2	11.4	5.5	8.0	9.6	9.1	9.0	8.5	4.8	7.3	8.4	8.7	7.3	7.4	5.6	6.8	6.9	6.8	6.1	6.5	4.0	6.4	6.4	8.0	6.6	6.2	4.7	7.4	8.0	8.3	7.6	6.7
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19.	Discuss your understanding about Null and Alternative Hypothesis																																										
20.	Write a short note on Errors in Hypothesis testing.																																										
21	What is critical region? Explain																																										
22.	Explain steps in solving testing of hypothesis problem																																										
23.	What is level of significance																																										
24.	<p>The manufacturer of a certain make of electric bulbs claims that his bulbs have a mean life of 25 months with standard deviation of 5 months. A random sample of 6 such bulbs gave the following values</p> <p>Life of bulb in months 24,26,30,20,20,18</p> <p>Is the manufacturer’s claim valid at 1% level of significance?(Given that the table values of the appropriate test statistics at said level are 4.032,3.707 and 3.499 for 5, 6 and 7 degree of freedom respectively)</p>																																										
25.	Explain Type 1 and type 2 Errors in detail.																																										
26.	Explain One tailed and Two tailed Tests.																																										
27.	Explain Parametric and Non Parametric tests of hypothesis																																										
28.	Introduction to Hypothesis Testing																																										

29.	Types of Errors
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