Unit VI (a)
Statistical Inference
Section - A

One mark questions:

1. Define parameter. (U)
2. Define statistic. (U)
3. What is parameter space? (K)
4. What is sample space? (K)
5. Define sampling distribution of a statistic. (U)
6. Define standard error. (U)
7. Write the formula of $\text{S.E.}\left(\bar{x}\right)$. (U)
8. Write the formula of $\text{S.E.}\left(\bar{x}_1 - \bar{x}_2\right)$. (U)
9. Write the formula of S.E. (p). (U)
10. Write the formula of S.E.$(p_1 - p_2)$, when $P_1 \neq P_2$. (U)
11. Write the formula of S.E.$(p_1 - p_2)$, when $P_1 = P_2$. (U)
12. A lot contains 2% defective items. 40 items chosen from it. Another lot contains 1% defective items. 60 items chosen from it. Find E (p_1-p_2). (U)
13. Write a use of standard error. (K)
14. What is statistical inference? (K)
15. Mention a branch of statistical inference. (K)
16. What is meant by estimation? (K)
17. Define an estimator. (U)
18. Define an estimate. (U)
19. Define point estimation. (U)
20. Define interval estimation. (U)
21. Define confidence interval. (U)
22. What are confidence limits? (K)
23. What is confidence coefficient? (K)
24. Define statistical hypothesis. (U)
25. Give an example for statistical hypothesis. (U)
26. Define null hypothesis. (U)
27. Give an example for null hypothesis. (U)
28. Define alternative hypothesis. (U)
29. Give an example for alternative hypothesis. (U)
30. What is type I error? (K)
31. What is type II error? (K)
32. Define size of a test. (U)
33. What is level of significance? (K)
34. Define power of a test. (U)
35. What is critical region? (K)
36. What is critical value? (K)
37. What is two tailed test? (K)
38. What is one tailed test? (K)
39. Define null distribution. (U)
40. Define test statistic. (U)

Section - B

Two mark questions:

41. Define parameter and statistic. (U)
42. Given $\sigma^2 = 9\ cm^2$ and n = 36, calculate standard error of sample mean. (A)
43. Sizes of two samples are 50 and 100. Population standard deviations are 20 and 10. Compute $S.E.\left(\bar{x}_1 - \bar{x}_2\right)$. (A)
44. If P = 0.02 and n = 64, then find S.E(p). (U)
45. If P = 0.1 and n = 100, then find S.E(p). (U)
46. A lot contains 2% defective items. 40 items chosen from it. Another lot contains 1% defective items. 60 items chosen from it. Find S.E.$(p_1 - p_2)$. (U)
47. For the following data, Find S.E.$(p_1 - p_2)$. (U)

Sample sizes	100	100
Population proportions	0.2	0.1

48. Write two uses of standard error. (K)
49. Mention two branches of statistical inference. (K)
50. Mention two types of estimation. (K)
51. What are point and interval estimations? (K)
52. What is statistical hypothesis? Give an example. (U)
53. What is null hypothesis? Give an example. (U)
54. What is alternative hypothesis? Give an example. (U)
55. Define type I and type II errors. (U)
56. Define size of a test and power of a test. (U)
57. What are one tailed and two tailed tests? (K)

Unit VI (b)

Large Sample Tests

Section - A

One mark questions:

58. Write an alternative hypothesis for null hypothesis: $\mu = \mu_0$. (K)

Section - B

Two mark questions:

59. Given $\bar{x}$ = 203 gm, μ = 200 gm, σ = 10 gm and n = 64, calculate test statistic Z. (A)
60. If $\left(\bar{x}_1 - \bar{x}_2\right)$ = 2.6 and $S.E.\left(\bar{x}_1 - \bar{x}_2\right)$ = 1.3, find test statistic Z. (U)

Section – C/E

Five mark questions:

61. A sample of 100 students is chosen from a large group of students. The average height of these students is 162 cm and standard deviation is 8 cm. At 5% level of significance can we reasonably assume that the average height of large group of students is 160 cm? (A)
62. A random sample of 400 tins of Vanaspati has mean weight 4.96 kg and standard deviation 0.4 kg. Test at 1% level of significance that the average weight of tins of Vanaspati is 5 kg? (A)

63. It is required to test whether those who practice Yoga have average blood sugar less than 120 mg/dl. A sample consisting of 36 persons who practice Yoga is observed. If their mean blood sugar is 118.5 mg/dl and variance is 9 mg^2/dl. At 1% level of significance what would you conclude? (K)
64. The average weekly sales of the chocobars in candy stores were 150 bars. After advertising campaign the average weekly sales in 64 stores for a typical week increased to 153 bars and standard deviation 10 bars. Is the advertisement campaign successful? (Use α = 0.01) (K)
65. A sample of 100 students is taken from a college. If the mean and S.D. of their weights are 51 kg and 5 kg respectively, test at 1% level of significance that the average weight of college students is 50 kg. (A)
66. A machine is designed to fill 500 ml of milk to polythene bags. A randomly selected 100 milk bags filled by this machine are inspected. The mean is found to be 499 ml and S. D. is 5 ml. Is the machine functioning properly at 5% level of significance? (K)
67. A random sample of 64 children is taken from a school. The average weight of the children is 29 kg and standard deviation is 5 kg. Can we assume that the average weight of the school children is less than 30 kg? (Use α = 0.05) (A)
68. A company manufactures car tyres. Their average life is 40,000 kilometres and standard deviation 5,000 kilometres. A change in the production process is believed to result in a better product. A test sample of 100 new tyres has mean life of 41,000 kilometres. Can you conclude at 5% L.O.S. that the new product gives better result? (A)
69. A specified brand of automobile tyre is known to have average life of 10,000 km with a S.D. of 500 km. A random sample of 36 tyres, when tested resulted in the average life of 9,800 km. At 1% level of significance what is your conclusion regarding average life of tyres?(U)
70. A random sample of 225 cans containing baby food has mean weight 998 gm and S. D. 15 gm. Test whether the mean contents of the cans be considered as 1 kg. Use 1% L.O.S. (A)
71. On 60 different days the number of passengers in a bus was noted. The mean and S. D. of the number of passengers was found to be 40 and 5 respectively. At 5% level of significance, test the hypothesis that the average number of passengers in the bus is more than 38. (A)
72. From the following data test whether mean daily wages of workers of Factory-A and Factory-B are equal. Use 1% L.O.S. (A)

Factory	No. of workers	Mean daily wages (in Rs.)	S.D. (in Rs.)
A	200	195	20
B	450	200	30

73. The mean I.Q. of 200 randomly selected boys of a college is 90 and that of 128 girls is 88. Standard deviations of their I.Q. are 10 and 8 respectively. Test whether there is a significant difference between average I. Q. of boys and girls at 5% level of significance. (A)
74. The mean and variance of heights of 60 randomly selected Punjabis are 178 cm and 9 cm^2 respectively. The mean and variance of heights of 40 randomly selected Guajaratis are 176 cm and 16 cm^2 respectively. Can we conclude that Punjabis are taller than Guajaratis? Use α = 5%. (U)

75. For the following data, test whether means differ significantly. Use α = 0.01. (A)

Sample	Size	Mean	S.D.
I	90	52	9
II	40	54	2

76. 450 boys and 350 girls appeared for II P.U.C examination. The mean and S.D. of marks obtained by boys are 53 and 18 respectively. The mean and S.D of marks obtained by girls are 50 and 14 respectively. Is there any significant difference between mean marks obtained by boys and girls? (Use α = 0.01) (U)
77. A random sample of 100 workers from South India shows that their daily mean wage is Rs. 446 with S.D. Rs. 20. A random sample of 150 workers from North India shows that their daily mean wage is Rs. 450 with S.D. Rs. 30. Test at 1% level of significance that, mean wages in South India is less than mean wages in North India. (A)
78. The mean and S.D. of marks obtained by 50 students of college A are 74 and 8 respectively. The mean and S.D. of marks obtained by 40 students of college B are 78 and 7 respectively. Is there any significant difference between mean marks of the students of two colleges? Test at 1% L.O.S. (U)
79. The mean weight of 50 boys of college A is 58 kg with variance 64 kg^2. The mean weight of 40 boys of college B is 54 kg with variance 49 kg^2. Can we conclude that boys of college A and boys of college B have same mean weight? Use 5% level of significance. (A)
80. A sample of 400 woman shoppers is chosen from market A. Their average weekly expenditure on food is Rs. 1000 with S.D. of Rs. 40. Another sample of 500 woman shoppers is chosen from market B. Their average weekly expenditure on food is Rs. 992 with S.D. of Rs. 50. Test at 5% level of significance that the average weekly expenditure on food is same. (A)
81. Intelligence test given to groups of boys and girls gave the following information:

	Mean	S.D.	Size
Boys	70	12	100
Girls	74	10	50

Is the difference in the mean scores of boys and girls statistically significant? Use 5% L.O.S. (U)

82. For the following data, test whether means differ significantly. Use α = 0.01 (U)

Sample	Size	Mean	S.D.
I	40	70	8
II	60	66	6

83. Test at 1% level of significance, that average life of bulbs manufactured by Firm-A is less than Firm-B. (A)

Firm	Size	Average life	Variance
A	32	1300 hours	64 $hours^2$
B	50	1305 hours	100 $hours^2$

84. Following is data regarding mean weights of randomly selected boys and girls of P.U.C. Test whether, mean weight of boys is greater than mean weight of girls. (Use α = 0.05) (A)

Sample	Boys	Girls
Size	64	48
Mean	63 kg	60 kg
S.D	8 kg	12 kg

85. Intelligence test given to groups of boys and girls gave the following information:

	Mean	S.D.	Size
Boys	74	12	100
Girls	70	10	50

Is the difference in mean score of boys and girls statistically significant? Use 1% L.O.S (A)

86. In a sample of 400 people from Kerala 180 are coffee drinkers and the rest are tea drinkers. Can we assume that both coffee and tea are equally popular in the state? Use 5% level of significance. (U)
87. A campus bulletin claims that only 36% of all college students visit the library in a week. A sample of 225 college students showed that 90 of them had visited the library. Can we accept the bulletin claim? (Use 1% L.O.S) (A)
88. From a random sample of 100 students from PUC, 13 students were found wearing spectacles. Can we conclude that propotion of students wearing spectacles is more than 0.1? Use $\alpha = 0.05$. (U)
89. A coin is tossed 400 times and head turns up 220 times. Can we conclude that the coin is unbiased? Use $\alpha = 0.05$. (A)
90. In a city, out of 900 men 486 were smokers. Does this information indicate that the majority of men in the city are smokers? Use 1% L.O.S. (U)
91. A manufacturer claims that less than 2% of his products are defective. A retailer buys a batch of 1000 articles from the manufacturer and finds that 10 are defective. Test at 5% level of significance that, whether the manufacturer's claim is justifiable. (A)
92. A stock broker claims that he can predict with 75% accuracy whether a stock market value will rise or fall during the coming month. In a sample of 50 predictions he is correct in 35. Does this evidence supports broker's claim at 5% level of significance? (U)
93. The manufacturer of surgical instruments claims that less than 1% of the instruments he supplied to a certain hospital are faulty. A sample of 300 instruments revealed that 6 were faulty. Test his claim at 1% level of significance. (A)
94. In a random sample of 1000 persons from a large population, 470 are women. Can we conclude that men and women are in the equal ratio in the population? (Use $\alpha = 0.05$). (U)
95. In an election the leaders of a party contend that they would secure more than 36% of votes. A pre-poll survey of 400 voters revealed that the percentage is 42. Does the survey support the leader's claim? (Use 1% L.O.S) (A)
96. In a random sample of 100 II PUC Statistics students 9 secured distinctions. At 5% level of significance, can we conclude that 10% of II PUC Statistics students secured distinctions? (U)
97. A stock broker claims that he can predict with 80% accuracy whether a stock market value will rise or fall during the coming month. In a sample of 40 predictions, 28 are correct. Does this evidence supports broker's claim at 1% level of significance? (U)
98. The manufacturer of surgical instruments claims that less than 2% of the instruments he supplied to a certain hospital are faulty. A sample of 400 instruments revealed that 12 were faulty. Test his claim at 5% level of significance. (A)

99. In a random sample of 80 persons from town A, 30 are found to be consumers of wheat. In a random sample of 40 persons from town B, 18 are found to be consumers of wheat. Does this data reveal a significant difference between proportion of wheat consumers in town A and town B? Use 5% L.O.S. (U)
100. In an institution, out of 500 students who took S.S.L.C. examination, 460 passed and out of 400 students who took P.U.C. examination, 350 passed. At 1% level of significance, can it be concluded that S.S.L.C. students have performed better than P.U.C. students? (U)
101. A machine produced 26 defective articles among 250. Another machine produced 4 defective articles among 50. Test whether there is any significant difference between population proportions. Use 5% level of significance. (A)
102. Among 400 students randomly selected from college A, 72% of students passed. Among 200 students randomly selected from college B, 66% of students passed. Can it be concluded that performance of college A is better than performance of college B? Use 5% level of significance. (U)
103. In a random sample of 120 people from a city in the year 2011 revealed that 96 were cricket match viewers. In another random sample of 100 people from same city in the year 2013 revealed that 90 were cricket match viewers. Examine whether there is a significant increase in the proportion of cricket match viewers. Use 1% level of significance. (A)
104. Among randomly selected 100 students of college A, 66 were passed. Among randomly selected 200 students of college B, 144 were passed. Test whether passing proportion is same in both the colleges. Use 5% L.O.S. (U)
105. Among 80 randomly selected persons from district A, 36 are interested in viewing hockey match. Among 40 randomly selected persons from district B, 12 are interested in viewing hockey match. Test at 5% level of significance that, the proportion of viewers in district A is more than district B. (A)
106. From the following data test whether, the difference between population proportions is significant at 5% level of significance. (U)

Sample	I	II
Size	200	100
Proportion	0.28	0.34

107. From the following data test whether, the difference between population proportions is significant at 1% level of significance. (U)

Sample	I	II
Size	100	400
Proportion	0.02	0.01

108. From the following data test whether, the difference between population proportions is significant at 5% level of significance. (U)

Sample	I	II
Size	200	100
Proportion	0.12	0.09

Unit VI (c)

t- Tests

Section - A

One mark questions:

109. Write an application of t-test. (K)

Section - B

Two mark questions:

110. Write two applications of t-test. (K)
111. Write down the t-test statistic and degrees of freedom in case of test for mean. (K)
112. Given, $\bar{x} = 53$ gm, $\mu = 50$ gm, s = 5 gm and n = 17, calculate test statistic t. (A)
113. Write down the t-test statistic and degrees of freedom in case of test for equality of means of two independent samples. (K)
114. Write down the test statistic and degrees of freedom of paired t-test. (K)
115. In paired t-test, if n = 5, $\bar{d} = 3$ and $s_d = 2$, then what would be the value of test statistic t? (K)

Section – C/E

Five mark questions:

116. The length of 10 samples of cotton taken from a population has mean length of 48cm and S.D. 3cm. Test whether the mean length of the population can be taken as 50cm? Use 5% level of significance. (A)
117. It is required to test whether those who practice yoga have average blood sugar less than 120 mg/dl. A sample consisting of 17 persons who practice yoga is observed. If their mean blood sugar is 108 mg/dl and S.D. is 8 mg/dl. What would you conclude? Use 5% level of significance. (U)
118. The mean weekly sales of the chocobar in candy stores were 146.3 bars. After advertising campaign the mean weekly sales in 22 stores for a typical week increased to 153.7 bars and showed S.D. of 17.2 bars. Was the advertisement campaign successful? Use $\alpha = 5\%$ (A)
119. A random sample of size 20 is taken from normal population gives a sample mean 42 and standard deviation 6. Test the hypothesis that the population mean is 44. Use $\alpha = 5\%$. (U)
120. A company has been producing steel tubes with mean inner diameter of 2 cm. A sample of 10 tubes gives a mean inner diameter of 2.01 cm and a variance of 0.004 cm^2. Is the company meeting the specification? Use $\alpha = 5\%$ (K)
121. A manufacturer is making axle with diameters 0.7". A random sample of 10 axles shows a mean diameter of 0.742" with S.D of 0.04". Test whether manufacturer is meeting the specification. Use $\alpha = 5\%$. (U)
122. The mean weekly sale of ice-cream bars was 140 bars. After an advertising campaign the mean weekly sale in 26 shops for a typical week increased to 150 and showed a S.D. 20. Is this evidence indicates that the advertising campaign successful? Use $\alpha = 1\%$. (A)
123. A soap manufacturing company was distributing a particular brand of soap through a large number of retail shops. Before a heavy advertisement campaign, the mean sale per week per shop was 140 dozens. After the campaign a sample of 26 shops was taken and mean

sales was found to be 147 dozens with standard deviation 16 dozens. Is advertisement effective? Use $\alpha = 5\%$. (K)

124. A survey in a locality revealed that on an average 180 persons read a particular newspaper. But the newspaper agent felt that it is more than 180. He conducted a survey in 10 localities and it was found that on an average 185 persons read that newspaper with S.D 6. Conduct the test at 1% level of significance (U)
125. The weights of 5 students of a college are 45, 47, 48, 49 and 51kg. Test whether the average weight of the students of the college is 50kg. Use $\alpha = 5\%$ (A)
126. Five students are selected at random from a college and their heights are found to be 149, 151, 152, 153 and 155cm. Test at 5% level of significance that the average height of the students of the college is 150 cm. (A)
127. A random sample of size 16 has mean 53. The sum of the squared deviations taken from mean is 150. Can this sample be regarded as taken from the population having mean 56? Use $\alpha = 0.01$. (U)
128. Mean and S.D. of heights of persons of two localities gave the following results.

	Locality A	Locality B
Sample size	12	8
Mean (cm)	175.3	177.7
S.D.(cm)	4.2	3.7

Can we conclude at 5% L.O.S. that the population of locality A on an average is shorter than locality B? (A)

129. For the following data test whether mean weight of group-I is greater than group-II (use k=1.81) (U)

	Group-I	Group-II
Sample size	7	5
Mean (kg)	50	48
Variance(kg^2)	5	3

130. The marks obtained by two groups of students in a statistics test are given below:

	Group A	Group B
No. of students	15	11
Mean marks	42	38
S.D. marks	10	15

On the basis of above data, can it be concluded that there is a significant difference in the mean marks obtained by the two groups? Use $\alpha = 5\%$. (A)

131. For the following data examine whether the means differ significantly? Use $\alpha = 5\%$. (U)

Sample	I	II
Size	12	7
Mean	57.2	52.3
S.D.	3.41	3.62

132. The average weight of 6 randomly selected women is 68 kg and that of 10 randomly selected men is 67.8 kg. Their variances of weights are 12 kg^2 and 17 kg^2 respectively. Test whether the average weight of women is more than men. Take $\alpha = 0.01$. (A)

133. I.Q. of 5 students before and after training is given below:

Student	1	2	3	4	5
Before training	110	123	120	132	125
After training	120	125	118	136	121

Test whether the training improves the I.Q. of students. (Take $\alpha = 0.01$) (U)

134. The following data represents the blood pressure of 5 persons before and after performing dhyana:

Person	A	B	C	D	E
B.P. Before Dhyana	90	90	100	88	99
B.P. After Dhyana	88	90	95	90	96

Can we conclude at 5% level of significance that Dhyana reduces blood pressure? (A)

135. Following is the data regarding the I.Q. of five students before and after treatment of Yoga:

I.Q. Before	118	120	116	115	125
I.Q. After	125	118	125	120	130

Is Yoga improves the I.Q. of students? Use 5% level of significance. (U)

136. An I.Q. test was conducted to 5 students before and after training and following data is obtained.

Student	1	2	3	4	5
I.Q. Before	121	128	120	118	125
I.Q. After	125	132	110	120	127

Test whether there is any significant difference between average I.Q. before and after training. (Take $\alpha = 0.01$). (A)

137. Five students were given intensive coaching and tests were conducted before and after coaching. The scores of the tests are given below. Do the scores after coaching show an improvement? (Use $\alpha = 0.05$). (U)

Student No	1	2	3	4	5
Marks before coaching	50	42	51	26	35
Marks after coaching	62	40	61	35	40

138. In geometry, first test was conducted to five boys of a school. They were given a month tuition and second test was held at the end of it. The scores of the tests are given below. Test whether the tuition was benefited the students. (Use $\alpha = 0.05$). (A)

Boys	1	2	3	4	5
Marks (I Test)	23	20	19	21	18
Marks (II Test)	24	18	21	18	20

139. A certain drug administered to 10 patients resulted in the following change in blood pressure:

-5, 2, -1, -3, 0, -2, 1, 5, 0, -4

Can it be concluded that the drug will decrease the blood pressure? Use $\alpha = 0.05$. (U)

140. Ten hyper tension patients, to whom a certain drug was administered, change in blood pressure are as follows:

-7, 3, -1, 4, -3, 5, -6, -4, 1, -2

Can it be concluded that the drug will decrease the blood pressure? Use $\alpha = 0.05$. (U)

Section - D

Ten mark questions:

141. A group of 5 students weigh 54, 58, 60, 62, 66 kg and another group of 7 students weigh 56, 58, 60, 62, 64, 66, 68 kg. Test whether the mean weight of first group is less than second group. Use $\alpha = 5\%$. (U)
142. The heights of 5 randomly chosen sailors are: 68", 70", 71", 72" and 74". The heights of 7 randomly chosen soldiers are: 67", 68", 69", 70", 71", 72" and 73". Do these figures show that soldiers are on an average shorter than sailors? Use $\alpha = 5\%$. (U)
143. Two different types of drugs A and B were tried on certain patients for increasing weight. 5 persons were given drug A and 7 persons were given drug B. The increase in weight in pounds is given below.

Drug A	13	7	11	9	10		
Drug B	10	4	7	9	6	8	5

Do the two drugs differ significantly with regard to their effect in increasing weight? Test at 5% L.O.S. (U)

Unit VI (d)
Chi-square Tests
Section - A

One mark questions:

144. Mention an application of χ^2 - test. (K)
145. Write the degrees of freedom in testing of population variance for a sample of size n. (K)
146. For the χ^2 - test, what is the condition for expected frequency? (K)
147. When do you pool the expected frequencies in testing of goodness of fit? (K)
148. What is the value of degrees of freedom in testing of independence of attributes in 2×2 contingency table? (K)

Section - B

Two mark questions:

149. Mention two applications of χ^2 - test. (K)
150. Write the χ^2 - test statistic with degrees of freedom in testing of population variance for a sample of size n. (K)
151. Write the χ^2 - test statistic with degrees of freedom in testing of goodness of fit. (K)
152. Mention two conditions for applying χ^2 - test of goodness of fit. (K)
153. In a χ^2 - test for goodness of fit, if there are 6 observations in which one parameter is estimated, then find the value of degrees of freedom of test statistic. (U)
154. Write the χ^2 - test statistic with degrees of freedom in testing of independence of attributes in 2×2 contingency table. (K)
155. Write two conditions for applying χ^2 - test of independence of attribute. (K)

Section – C/E

Five marks questions:

156. A normal variate has variance 8. Twenty sample observations of the variate have variance 9. Test at 1% level of significance whether the population variance is 8. (A)

157. A normal variate has variance 81. Twenty one random observations of the variate have variance 100. Test at 1% level of significance whether the sample variance differs significantly from the population variance. (U)

158. The standard deviation of production of paddy is assumed to be 10.6 tons. A sample of 20 acres showed that the standard deviation is 8.3 tons. Test at 1% level of significance whether the standard deviation of production of paddy is less than 10.6 tons. (A)

159. A random sample of size 25 taken from a population gives the sample standard deviation 8.5. Test the hypothesis that the population standard deviation (σ) is 10. Use $\alpha = 0.05$. (U)

160. A manufacturer claims that the life time of batteries produced by the factory has variance 4000 hours^2. To test this, a sample of 18 batteries were tested and found the variance of 6000 hours^2. Test the manufacturer's claim at $\alpha = 0.05$. (A)

161. Test the hypothesis $\sigma = 5$, given that sample standard deviation is 6 for a random sample of size 25 from a normal population. Use $\alpha = 0.05$. (U)

162. The variance of the height of 20 SSLC students is 4 cm^2. Test at 1% level of significance that the variance of height of SSLC students is more than 3 cm^2. (A)

163. Following are the points scored by five students in a competition:
1, 13, 9, 5, 7
Test at 5% level of significance that the population variance is more than 15. (U)

164. The tensile strength of 8 rods were 8, 3, 12, 14, 7, 13, 9 and 6 tons. Test the hypothesis that the standard deviation is more than 2 tons. Use 5% L.O.S. (A)

165. Weights in kg. of 10 students are given below:
38, 40, 45, 53, 47, 43, 55, 48, 52, 49
Can we say that variance of the distribution of weights is equal to 20 kg^2? Use 5% L.O.S. (U)

166. Weights of 10 students are given below:
Weight (in kg) : 32, 48, 50, 47, 49, 55, 46, 51, 46, 50.
Can you conclude that standard deviation of the distribution of weights of students is 4 kg? Use 1% L.O.S. (A)

167. Binomial distribution is fitted to an observed frequency distribution after estimating 'p' from the observed data. The observed and the expected frequencies are given below.

X	0	1	2	3	4	5
O_i	14	56	110	88	40	12
E_i	10	50	100	100	50	10

Test whether B.D. is a good fit. Use $\alpha = 0.05$. (S)

168. From the following data, test whether the Poisson distribution is a good fit. The values are tabulated after estimating the parameter. Use $\alpha = 0.01$. (S)

O_i	46	29	12	7	4	2
E_i	37	37	18	6	2	0

169. 70 accidents that have occurred in a state in a week are tabulated as follows:

Day	Sun	Mon	Tue	Wed	Thu	Fri	Sat
Accidents	7	8	11	12	5	13	14

Test whether accidents occur uniformly throughout the week. ($k_2 = 16.81$) (A)

170. In 120 throws of a die, the following distribution of faces was obtained.

Faces	1	2	3	4	5	6	Total
Frequency	30	25	18	10	22	15	120

Test at 5% level of significance that the die is unbiased. (U)

171. A die is thrown 120 times and the results are as follows.

Face of die	1	2	3	4	5	6
Frequency	12	18	20	32	20	18

At 5% level of significance, test whether the die is fair. (A)

172. Among 64 offspring of certain cross breed of guinea pigs, 34 were red, 10 were black and 20 were white. According to genetic model, these numbers should be in the ratio of 9 : 3 : 4. Are the data consistent with model at the 5% level of significance? (U)

173. A sample analysis of examination results of 500 students was made. It was found that 220 students had failed, 170 had secured 3rd class, 90 were placed in 2nd class and 20 got 1st class. Do these figures commensurate with the general examination result which is in the ratio of 4 : 3 : 2 : 1 for various categories respectively. (U)

174. The following is the data regarding family condition and examination result of 100 students. Test whether family conditions and results are independent. ($k_2 = 6.63$) (A)

Family Condition	Examination Result	
	Pass	Fail
Good	30	10
Bad	20	40

175. From the following data, test whether 'education' and 'employment' are independent at 1% level of significance. (U)

Education	Employment	
	Employed	Unemployed
Educated	20	25
Uneducated	15	40

176. From the following data test whether the attributes 'literacy' and 'smoking' are independent. Use 5% level of significance. (A)

	Literates	Illiterates
Smokers	7	18
Non-smokers	13	12

177. An opinion poll was conducted to find the reaction to a proposed civic reform in 100 members of each of the two political parties. The information is tabulated below.

Party	Favourable	Unfavourable
A	40	60
B	50	50

Test whether political parties and the reaction to a proposed civic reform are independent. (U)

178. From the following data test whether the examination result depends on special coaching. Use 1% level of significance. (A)

Special coaching	Examination Result	
	Pass	Fail
Taken	210	90
Not taken	60	40

179. Consider the following 2×2 contingency table. Test whether X and Y are independent at 1% level of significance. (U)

X / Y	X_1	X_2
Y_1	6	24
Y_1	14	16

180. 40 students of college A and 80 students of college B are appeared for an examination. The results are as follows.

College	Examination Result	
	Pass	Fail
A	26	14
B	60	20

Is result depends on college? Use $\alpha = 0.05$ (A)

181. In an experiment of immunization of cattle for tuberculosis, the following results were obtained.

Vaccine	Affected	Unaffected
Inoculated	12	26
Non-inoculated	16	6

Test whether the vaccine is effective in controlling tuberculosis. Use $\alpha = 0.01$. (U)

182. Of the 500 workers in a factory exposed to an epidemic, 350 were attacked, 200 had been inoculated and of these 100 were attacked. Test whether inoculation and attack of epidemic are independent. Use $\alpha = 0.05$ (S)

183. In a survey of 200 boys 75 were intelligent. Among intelligent boys 40 had skilled fathers. While 85 of the unintelligent boys had unskilled fathers. Do these figures support the hypothesis that skilled fathers have intelligent boys? Use $\alpha = 0.05$ (S)

Section – D

Ten mark questions:

184. Fit a binominal distribution to the following data and test for goodness of fit. Use $\alpha = 5\%$. (A)

Number of defective balloons	0	1	2	3	4
Number of packets	6	12	22	24	16

185. Records of 800 families about the number of male births in a family of four children are given below:

Male births	0	1	2	3	4
No. of families	46	194	270	230	60

Test the hypothesis that male and female births are equally likely at 5% level of significance. (U)

186. Four coins are tossed 100 times and the following distribution is obtained:

No. of Heads (x)	0	1	2	3	4
No. of Tosses (f)	8	32	33	22	5

Fit a binomial distribution when nature of the coin is not known. Test for goodness of fit at 5% L.O.S. (A)

187. Five coins are tossed 256 times and the following distribution is obtained.

No. of heads	0	1	2	3	4	5
No. of tosses	35	39	45	62	50	25

Fit a binomial distribution when nature of the coin is not known. Test for goodness of fit at 1% level of significance. (U)

188. The following mistakes per page were observed in a book.

No. of mistakes per page	0	1	2	3	4 and more
No. of pages	68	37	10	5	0

Fit a Poisson distribution to the data and test the goodness of fit. Use α = 5%. (A)

189. Following is the data regarding number of mistakes per page found in a book. Fit a Poisson distribution. Test at 5% L.O.S. that it is a good fit. (U)

No. of mistakes per page	0	1	2	3	4	5 and more
No. of pages	31	34	21	12	2	0

190. The following data shows the number of mistakes per page in a book containing 100 pages.

No. of mistakes per page	0	1	2	3	4 and more
No. of pages	20	45	30	5	0

Fit a Poisson distribution to the data and show that the distribution is not good fit. Use α = 5%. (S)

191. Fit a Poisson distribution to the following data and test whether the distribution is a good fit. Use 5% L.O.S. (A)

X	0	1	2	3	4	5
f	46	29	12	7	4	2