Unit-5 Statistical Inference

1) A manufacturer claimed that at least 95% of the equipment which he supplied to a factory conformed to specifications. An examination of a sample of 200 pieces of equipment revealed that 18 were faulty. Test the claim at 5% level of significance.

2) A new computer network is being designed. The makers claim that it is compatible with more than 99% of the equipment already in use.
   a. Set up the null and alternative hypothesis needed to get evidence to support this claim.
   b. A sample of 300 programs is run, and 298 of these run with no changes necessary. That is, they are compatible with the new network. Can H_0 be rejected?
   c. What practical conclusion can be drawn on the basis of your test results?

3) It is thought that over 60% of the business offices in the United States have a mainframe computer as part of their equipment.
   a. Set up the appropriate null and alternative hypothesis for supporting this claim.
   b. When data are gathered, it is found that 233 of the 375 offices studied have mainframe computers. Can H_0 be rejected at the $\alpha = 0.05$ level?
   c. What practical conclusion can be drawn on the basis of your test results

4) A random samples of 400 men and 600 women were asked whether they would like to have a flyover near their residence. 200 men and 325 women were in favour of the proposal. Test the hypothesis that proportions of men and women in favour of the proposal are same, at 5% l.o.s?

5) A machine produces 16 imperfect articles in a sample of 500. After machine is overhauled, it produces 3 imperfect articles in a batch of 100. Has the machine been improved?

6) In a sample of 600 men from a certain city, 450 are found smokers. In another sample of 900 men from another city 375 are smokers. Do the data indicate that the cities are significantly different with respect to the habit of smoking among men?

7) An inventor develops a new, energy-efficient lawn mower engine. He claimed that the engine will run continuously for 300 minutes on one gallon of regular gasoline. From his stock of engines, he selected a random sample of 50 engines for testing and found that on average they ran 305 minutes with a standard deviation of 30 minutes. Test the claim at 5% level of significance.

8) In a random sample of 60 workers, the average time taken by them to complete the work is 40 minutes with a standard deviation of 6.5 minutes. Can you say that work will complete with in 38 minutes at 5% level of significance?

9) An ambulance service claims that it takes on the average 15 minutes to reach the destination in emergency calls. A sample of 40 calls has a mean of 17 minutes and variance of 16 minutes. Test the claim at 5% l.o.s?

10) A sample of 400 items is taken from a population whose S.D is 10. The mean of sample is 40. Test whether the sample has come from a population with mean 38. Also calculate 95% confidence interval for the population mean?

11) Samples of students were drawn from two colleges and their weights in kilograms during the lockdown period of COVID-19 are gathered and shown below

	Mean	S.D	Sample size
College-A	55	10	400
College-B	57	15	100

Make a large sample test to test the significance of difference between the means at 5% l.o.s

12) The research investigator is interested in studying whether there is a significant difference in the salaries of Software professionals in two metropolitan cities. A random sample of 100 from Bangalore yields on the average income of Rs.90150 with the variance of Rs.30000. Another random sample of 60 from Chennai results in an average income of Rs.85250 with a variance of Rs.22000. Set up the appropriate null and alternative hypothesis and test the significant difference?

13) A mechanist is making engine parts with axle diameters of 0.700 inch. A random sample of 10 parts shows a mean diameter of 0.742 inch with a S.D of 0.040 inch. Compute the statistic you would use to test whether the work meeting the specification at 0.05 l.o.s.

14) A sample of 26 bulbs gives a mean life of 990 hours with a standard deviation of 20 hours. The manufacturer claims that the mean life of bulbs is 1000 hours. Is the sample not up to the standard? (value of t-statistic for 25 df at 5% l.o.s is 1.708)

15) A random sample of 10 boys had the following I.Q's : 70,120,110,101,88,83,95,98, 107,100. Do the data support the assumption of a population mean I.Q of 100? Find a reasonable range in which most of the mean IQ values of sample of 10 boys lie. Use 5% l.o.s.

16) Two types of cars produced in U.S.A are tested for petrol mileage and the following information is obtained

	Average Mileage	S.D Mileage	Sample size
Car-A	25	8	8
Car-B	20	5	7

Is the difference in the average mileage significant?

17) In one sample of 8 observations from normal population, the sum of the squares of deviations of the sample values from the sample mean is 84.4 and in another sample of 10 observations it was 102.6. Test at 5 % level whether the populations have the same variance.