

PROBABILITY AND STATISTICS
Unit-III (Tests of Hypothesis For Large Samples)
(Common to CSM & DS)

B.Tech ,II Year, I Sem (2024-2025)

CODE :9HC16

Assignment Questions

1. A sample of 64 students have a mean weight of 70kgs. Can this be regarded as a sample from a population with mean weight 56 kgs and standard deviation 25kgs use $\alpha=0.05$.

Ans: Use two tailed test, $Z_{Cal}=4.48$, $Z_{\alpha/2}=Z_{0.05/2}=Z_{0.025}=1.96$, Conclusion: Reject Null Hypothesis(H_0) i.e this sample cannot be regarded as coming from the population.

2. The length of life X of certain computer is approximately normally distributed with mean 800 hours and standard deviation 40 hours. If a random sample of 30 computers has an average life of 788 hours. Test the null hypothesis that $\mu=800$ hours against alternative hypothesis that $\mu \neq 800$ hours at (a) 1% (b) 5% level of significance.

Ans: using two tailed test (a) Null hypothesis: $\mu=800$, Since Z_{Cal} falls in acceptable region i.e $-Z_{\alpha/2}=-2.58 < Z_{Cal}=-1.64 < Z_{\alpha/2}=2.58$, Conclusion: Accept Null Hypothesis(H_0). (b) $Z_{\alpha/2}=Z_{0.05/2}=Z_{0.025}=1.96$, $Z_{Cal}=-1.64$, Conclusion: Accept Null Hypothesis(H_0)

3. The mean life time of a sample of 100 tube lights produced by a company is found to be 1570 hrs with population standard deviation 120 hrs. Test hypothesis for $\alpha=0.05$ that the mean life time of tubes produced by the company is 1600 hrs.

Ans: Apply two tailed test, $Z_{\alpha/2}=Z_{0.05/2}=Z_{0.025}=1.96$, $Z_{Cal}=-2.5$ Conclusion: Reject Null Hypothesis(H_0)

4. The means of two large samples of sizes 1000 and 2000 members are 67.5 inches and 68.0 inches respectively. Can the samples be regarded as drawn from same population of standard deviation 2.5 inches use $\alpha=0.05$.

Ans: Apply two tailed test, $Z_{Cal}=-5.16$, $Z_{\alpha/2}=Z_{0.05/2}=Z_{0.025}=1.96$
Conclusion: Reject Null Hypothesis(H_0) i.e the samples are not drawn from the same population of S.D of 2.5 inches.

5. In a random sample of 100 tube lights produced by company A, the mean lifetime of tube light is 1190 hours with standard deviation of 90 hours. Also in a random sample of 75 tube lights from company B the mean lifetime is 1230 hours with standard deviation of 120 hours. Is there a difference between the mean lifetimes of the two brands of tube lights at a significance level of 0.05?

Ans. Null hypothesis: $H_0: \mu_A - \mu_B = \delta = 0$ i.e No difference, Apply two tailed test, $Z_{Cal}=-2.421$, $Z_{\alpha/2}=Z_{0.05/2}=Z_{0.025}=1.96$, Accept Null Hypothesis(H_0)

Practice Problems

1.If in a random sample of 600 cars making a right turn at a certain traffic junction 157 drove in to the wrong line, test whether actually 30% of all drivers make this mistake or not at this given junction. Use (a) 0.05 (b) 0.01 L.O.S.

Ans (a) the test is two tailed ,Null hypothesis: $p=0.3$, $Z_{Cal}=-2.0489$, $Z_{\alpha/2}=Z_{0.05/2}=Z_{0.025}=1.96$ Conclusion: Reject Null Hypothesis(H_0)

(b) the test is two tailed ,Null hypothesis: $p=0.3$, $Z_{Cal}=-2.0489$, $Z_{\alpha/2}=Z_{0.01/2}=2.57$ Conclusion: Accept Null Hypothesis(H_0)

2. Test the claim of manufacturer that 95% of stabilizers conform to ISI specification. If out of random sample of 200 stabilizers, produced by this manufacturer 18 were faulty use $\alpha=0.01$.

Ans: the test is two tailed ,Null hypothesis: $p=0.95$, A.H: $p<0.95$ $Z_{Cal}=-2.5957$, $Z_{\alpha}=Z_{0.05}=-2.33$ Conclusion: Reject Null Hypothesis(H_0).

3. In hospital 480 females and 520 male babies were born in a week. Do these figures confirm the hypothesis that males and females are born in equal number use 5% LOS.

Ans: 18. $z = 1.265$ Accept H_0

4.Out of two welding machines at a super market ,the first machine fails to work 13 times in 250 trials and second fails to work 7 times in 250 trials.

Test whether the difference between corresponding population proportion is significant?(use $\alpha=0.05$).

Ans: Apply two tailed test Null hypothesis : $H_0 :p_1=p_2=\delta=0$ i.e No difference, $Z_{\alpha/2}=Z_{0.05/2}=Z_{0.025}=1.96$, .H: $p<0.95$ $Z_{Cal}=-1.369$, Conclusion: Accepted Null Hypothesis(H_0), Hence there is no difference between population proportion of the first machine and second machine .

5. In a random sample of 1000 persons from town A,400 are found to be consumers of wheat. In a sample of 800 from town B,400 are found to be consumers of wheat. Do these data reveal a significant difference between town A and B, as the proportion of wheat consumers is concerned use 1% LOS?

Ans: Apply two tailed test Null hypothesis : $H_0 :p_1=p_2$, $Z_{\alpha/2}=Z_{0.01/2}=2.58$, $H_1:p<0.95$ $Z_{Cal}=4.17$, Conclusion: Reject Null Hypothesis(H_0).

Short questions

- 1.Define Level of significance in test of hypothesis.
- 2.Define Null Hypothesis hypothesis

3. Define Alternate hypothesis
4. Write the test statistic for the test of hypothesis concerning difference in two means for large samples.
5. Define Type - I and Type - II Errors.
6. Large sample theory is applicable when sample size is----
7. Write the test statistic for the test of hypothesis concerning difference between two proportions for large samples.
8. Define critical region.
9. Define critical value.
10. What is single tailed test.