

TESTING OF HYPOTHESIS

Question 1

Write a short note on the procedure in hypothesis testing.

Answer

Procedure in Hypothesis Testing: Following procedure is followed in hypothesis testing:

1. Formulate the hypotheses: Set up a null hypothesis stating, for e.g. $H_0 : \theta = \theta_0$ and an alternative hypothesis H_1 , which contradicts H_0 . H_0 and H_1 cannot be done simultaneously. If one is true, the other is false.
2. Choose a level of significance, i.e. degree of confidence. This determines the acceptance rejection region. For example, $Z_{.05}$ in a 2 tailed 'Z' test is.
3. Select test statistic: For $n > 30$, Z statistic is used, implying normal distribution for large samples. For small samples, we use t_1 , F_1 and χ^2 distribution.
4. Compute the sample values according to the test statistic.
5. Compare with the table value of the statistic and conclude.

Question 2

A factory manager contends that the mean operating life of light bulbs of his factory is 4,200 hours. A customer disagrees and says it is less.

The mean operating life for a random sample of 9 bulbs is 4,000 hours, with a sample standard deviation of 201 hours.

Test the hypothesis of the factory manager, given that the critical value of the test statistic as per the table is (-) 2.896.
(6 Marks)(June, 2009)

AnswerManager's Hypothesis $H_0 \quad \mu_0 = 4,200$ $H_1 \quad \mu < 4,200$ (Left Tail test)

$$t = \frac{\bar{x} - \mu_0}{\sigma},$$

$$\text{where } \sigma = \frac{s}{\sqrt{n}} = \frac{201}{\sqrt{9}} = \frac{201}{3} = 67$$

$$t = \frac{4,000 - 4,200}{67} = \frac{-200}{67} = -2.985$$

Calculated $t = 2.985$, < table value of $t_{.01}$ (sdf) which is -2.896 Hence reject the null hypothesis H_0 . i.e. Accept H_1 **The customer's claim is correct.****Question 3**

In the past, a machine has produced pipes of diameter 50 mm. To determine whether the machine is in proper working order, a sample of 10 pipes is chosen, for which mean diameter is 53 mm and the standard deviation is 3 mm. Test the hypothesis that the machine is in proper working order, given that the critical value of the test statistic from the table is 2.26.

*(4 Marks)(Nov., 2009)***Answer**Null Hypothesis $H_0 : \mu = 50$ mm i.e. the M/c works properly. $H_1 : \mu \neq 50$ mm. i.e. the M/c does not work properly

Sample Size = 10, small.

use 't' statistic

$$t = \frac{\bar{x} - \mu}{S / \sqrt{n-1}}$$

$$\bar{x} = 53$$

$$\mu = 50$$

$$n = 10; \sqrt{n-1} = \sqrt{9} = 3$$

$$S = \text{std dev} = 3$$

$$T = \frac{53 - 50}{3/3} = \frac{3}{1} = 3$$

Table Value = 2.26

Calculated $t >$ table value

Reject H_0

i.e. The M/c is not working properly.

Question 4

A potato chips manufacturing company decided that the mean net weight per pack of its product must be 90 grams. A random sample of 16 packets yields a mean weight of 80 grams with standard deviation of 17.10 grams. Test the hypothesis that the mean of the whole universe is less than 90, use level of significance of (a) 0.05 (b) 0.01. (5 Marks)(Nov., 2010)

Answer

Test of Hypothesis

$$H_0: \mu_0 = 90$$

$$H_1: \mu_0 < 90 \text{ (Left tail test)}$$

As n is small, <30 , we use the t Statistic

$$t = (\bar{X} - \mu_0) / \sigma$$

$$\sigma = S / \sqrt{n} = 17.10 / \sqrt{16} = 4.275$$

$$t = (80 - 90) / 4.275 = -2.339 \approx -2.4$$

Calculated $t = -2.339$, $<$ table value of $t_{0.05}$ (15 degrees of freedom) which is -1.753 Hence, reject the null hypothesis at 5% level of significance

Calculated $t = -2.339$, $>$ table value of $t_{0.01}$ (15 dof) which is -2.602. Hence, accept the null hypothesis at 1% level of significance.