**[Que-35] - A random sample of size 25 from a population gives the sample standard derivation to be 9.0. Test the hypothesis that the population standard derivation is 10.5. Hint(Use chi-square distribution).**

To test the hypothesis that the population standard deviation is 10.5, we can use the chi-square distribution. The test is based on the chi-square statistic for a sample standard deviation, which is calculated as follows:

χ2=((n−1)s2) / σ2

where:

* n is the sample size,
* s is the sample standard deviation,
* σ is the hypothesized population standard deviation.

Given:

* Sample size (n) = 25
* Sample standard deviation (s) = 9.0
* Hypothesized population standard deviation (σ) = 10.5

### **Hypotheses**

* Null hypothesis (H0 ): The population standard deviation is 10.5 (σ=10.5).
* Alternative hypothesis (H1 ): The population standard deviation is not 10.5 (σ=10.5).

### **Calculation**

1. Calculate the chi-square statistic:
2. χ2=((25−1)×9.02)/10.52 ≈17.62
3. Determine the degrees of freedom: Degrees of freedom=n−1=25−1=24
4. Find the critical values from the chi-square distribution table for α=0.05 (assuming a 95% confidence level for a two-tailed test):
   * Lower critical value: χ0.025,242 ≈13.848
   * Upper critical value: χ0.975,242 ≈36.415

### **Decision**

* If the calculated chi-square statistic falls between the lower and upper critical values, we fail to reject the null hypothesis.
* If the calculated chi-square statistic is outside this range, we reject the null hypothesis.

In this case, the calculated chi-square statistic (17.62) is between the lower critical value (13.848) and the upper critical value (36.415).

Therefore, we fail to reject the null hypothesis at the 0.05 significance level. This means that there is not enough evidence to conclude that the population standard deviation is different from 10.5.