**[Que-37] - 100 students of a PW IO! obtained the following grades in Data Science paper: Grade ;[A, B, C, D, E] Total Frequency :[15, 17, 30, 22, 16, 100] Using the y 2 test , examine the hypothesis that the distribution of grades is uniform.**

To test the hypothesis that the distribution of grades is uniform using the chi-square (χ2) test, we can follow these steps:

### **Step-by-Step Solution**

1. **State the Hypotheses:**
   * Null hypothesis (H0 ): The grades are uniformly distributed.
   * Alternative hypothesis (H1 ): The grades are not uniformly distributed.
2. **Observed Frequencies (O):**
   * Grade A: 15
   * Grade B: 17
   * Grade C: 30
   * Grade D: 22
   * Grade E: 16
   * Total: 100
3. **Expected Frequencies (E):** If the grades are uniformly distributed, each grade should have the same frequency. Since there are 5 grades and 100 students:

E=Number of GradesTotal Frequency =5100 =20

So, the expected frequency for each grade is 20.

1. **Calculate the Chi-Square Statistic:**

χ2=∑Ei (Oi −Ei )2

Where Oi is the observed frequency and Ei is the expected frequency.

Let's calculate the chi-square statistic:

χ2=25/20 +9/20 +100/20 +4/20 +16/20

χ2=1.25+0.45+5+0.2+0.8=7.7

1. **Determine the Degrees of Freedom:** Degrees of freedom (df) for this test is the number of categories minus 1:

df=5−1=4

1. **Find the Critical Value:** For a significance level (α) of 0.05 and 4 degrees of freedom, the critical value from the chi-square distribution table is approximately 9.488.
2. **Compare the Chi-Square Statistic to the Critical Value:**

χ2=7.7and the critical value is9.488

Since 7.7 < 9.488, we fail to reject the null hypothesis.

### **Conclusion**

There is not enough evidence at the 0.05 significance level to reject the hypothesis that the grades are uniformly distributed.