**Kolmogorov-Smirnov Test**

**Algorithm:**

**Step 1: Rank data from smallest to largest (Sort them in Ascending Order)**

**Step 2: Compute the following:**

 **D+ = Max { i/N – Ri } where 1 <= i <= N**

 **D- = Max { Ri – (i-1)/N} where 1 <= i <= N**

 **D = Max [D+,D-]**

**Step 3: Locate in the table for the critical value of Dα for specified level** **αin sample N**

**Step 4: If the calculated D > Dα, then the Hypothesis is rejected or else the random numbers which are generated are uniformly distributed.**

**Example:**

**Input: {0.44, 0.81, 0.14, 0.05, 0.93}, α = 0.05**

**N = 5**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **i = 1**  | **i = 2** | **i = 3** | **i = 4** | **i = 5** |
| **Ri** | **0.05** | **0.14** | **0.44** | **0.81** | **0.93** |
| **i/N** | **0.2** | **0.4** | **0.6** | **0.8** | **1.0** |
| **i – 1/N** | **0** | **0.2** | **0.4** | **0.6** | **0.8** |
| **i/N - Ri** | **0.15** | **0.26** | **0.16** | **-** | **0.07** |
| **Ri –  i-1/N** | **0.05** | **-** | **0.04** | **0.21** | **0.13** |

**D+ = 0.26, D- = 0.21, D = Max [0.26, 0.21] = 0.26**

**Since D = 0.26 < Dα = 0.56**, **the Hypothesis is accepted, which means random numbers are uniformly distributed**

**Chi-Square Test**

**Algorithm:**

**Step 1: Based on the generated random numbers arrange them into intervals and fix the upper limits**

**Step 2: Calculate the following**

 **0i = Actual Outcomes**

 **Ei = Expected Outcomes**

 **Oi – Ei = Diff b/w Oi,Ei**

 **Respectively (Oi – Ei)2, (Oi – Ei )/ Ei**

**Step 3: Find the D = sum of (Oi – Ei )/ Ei**

**Step 4: Locate in the table for the critical value of Dα for specified level** **αin sample N – 1**

**Step 5: If the calculated D > Dα, then the Hypothesis is rejected or else the random numbers which are generated are uniformly distributed.**

**Example:**

**Input: {0.01, 0.1, 0.11, 0.02, 0.58, …………………………….. } total 100 random numbers**

**α = 0.05**

**Solution:**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Interval** | **Upper Limit** | **Oi** | **Ei** | **(Oi-Ei)** | **(Oi-Ei)2** | **(Oi-Ei)2/Ei** |
| **1** | **0.1** | **10** | **10** | **0** | **00** | **0** |
| **2** | **0.2** | **9** | **10** | **-1** | **01** | **0.1** |
| **3** | **0.3** | **5** | **10** | **-5** | **25** | **2.5** |
| **4** | **0.4** | **6** | **10** | **-4** | **16** | **1.6** |
| **5** | **0.5** | **16** | **10** | **6** | **36** | **3.6** |
| **6** | **0.6** | **13** | **10** | **3** | **09** | **0.9** |
| **7** | **0.7** | **10** | **10** | **0** | **00** | **0** |
| **8** | **0.8** | **7** | **10** | **3** | **09** | **0.9** |
| **9** | **0.9** | **10** | **10** | **0** | **00** | **0** |
| **10** | **1.0** | **14** | **10** | **4** | **16** | **1.6** |
|  |  | **(100)** |  |  |  | **(11.2)** |
|  |  |  |  |  |  |  |

**From the table we check the α = 0.05 value for N-1 = 10-1 = 9**

**Since D = 11.2 < Dα = 16.919, Hypothesis is accepted and hence the random numbers are uniformly distributed**