Lab Sheet - 3

Objective: **Generation of Random number**

Theory

Continuous uniformly distributed random numbers means the set of random numbers where probability of any number in any integral within a certain range of values is proportional to the ratio of the interval size to the range. There are many different methods to obtain the random numbers. They are:

1. Random numbers from table.
2. From hardwired device.
3. Using pseudo Number generation.

So in our lab, we focused on the generation of random number using pseudo random and Chi-square test to verify their acceptance.

Generation of pseudo random numbers (congruence Method):

In this method, we use one initial number (r_0 called seed) and few constants. Using the seed and the formula,

$r_{i+1} = (r_i \times a + b)$ (modulo P)

Where 'a' and 'b' are constant and P is that number which is the upper limit of required random number. This finds the number in the closed interval [0,P-1]

Conditions:

1. If a=1 the method is called additive.
2. If b=0 the method is called multiplicative.
3. Other wise the method is called mixed.

Test for random number:

Frequency tests, Runs test, correlation test, Gap test and Poker test are some of the well-known tests. Here we describe the frequency test (chi-square test).

Chi-square test uses the sample statistics

$$X_0^2 = \sum (Oi - Ei)^2 / Ei \qquad \text{for i=1 to N}$$

Where,

Ei = N/n is expected number and

Where N is the Number of observations and n is the Number of Classes.

Oi = is the observed number

For given confidence level and degree of freedom, acceptance value is found out from table. If the calculated value is grater than the numbers are accepted fro their uniformity of distribution.