[20]

1. Suppose you have a 5 * 5 array. Each cell of the array is either 0 (Dead) or 1 (Alive) . Now The value of a given cell at the next instant of time depends on the state of its neighbours at the previous time step. There are four rules:

1. If a cell is Alive and has fewer than two neighbours that are Alive, it dies on the next time step. (For Underpopulation)
2. If a cell is Alive and has either two or three neighbours that are alive, it remains Alive on the next time step.
3. If a cell is alive and has more than three neighbours that are Alive, it dies on the next time step. (For Overpopulation :3)
4. If a cell is Dead and has exactly three neighbours that are alive, it turns Alive on the Next Generation.

Example:

Time 0	Time -1	Time- 2	Time -3
0 1 0 0 0 0 0 1 0 0 0 1 1 0 1 0 1 0 0 1 0 0 0 0 0	0 0 0 0 0 0 0 1 1 0 0 1 1 0 0 0 1 1 1 0 0 0 0 0 0	0 0 0 0 0 0 1 1 1 0 0 0 0 0 0 0 1 0 1 0 0 0 1 0 0	0 0 1 0 0 0 0 1 0 0 0 1 0 1 0 0 0 1 0 0 0 0 1 0 0

So Use any programming language to solve this problem. Simulate your code up to 20-time steps and print the array at each time step. Use the above array at time = 0 for initialization.

2. Suppose G1, G2 and G3 are two seperate Congruential Generators. The specification and recursive relation of both generators are given below: **[10]**

G1	$Z_{1,i}=(13Z_{1,i-1}+ 11Z_{1,i-2}+3)$ mod 16, $Z_{1,0}=12$, $Z_{1,1} =7$ ($Z_{1,i}$ means Z_i of first CG)
G2	$Z_{2,i}= (12Z_{2,i-1}^{2}+ 13Z_{2,i-2})$ mod 17, $Z_{2,0}=3$, $Z_{2,1}=5$ ($Z_{2,i}$ means Z_i of second CG)

G3	$Z_{3,i} = (Z_{3,i-1}{}^3 + Z_{3,i-2}{}^2) \bmod 15$, $Z_{3,0}=2$, $Z_{3,1}=7$ ($Z_{3,i}$ means Z_i of Third CG)

Now G1, G2 and G3 are combined together to generate a random number. Write a code to implement Wichman / Hill Method. Generate 100, 1000 and 5000 random numbers. Show a histogram,

                X -axis: index of a random number, i

                 Y-axis: the random number Z_i