Lab Nr. 6, Probability and Statistics

Random Number Generators; RND;

Computer Simulations of Discrete Random Variables

1. Function **rnd** in Statistics Toolbox; special functions **rand** and **randn**.

2. Using a $\mathcal{U}(0,1)$ (standard uniform) random number generator, write Matlab codes that simulate the following common discrete probability distributions:

a. Bernoulli Distribution $Bern(p)$, with parameter $p \in (0,1)$: $X \left(\begin{array}{cc} 0 & 1 \\ 1-p & p \end{array} \right)$;

b. Binomial Distribution $Bino(p)$,with parameters $n \in \mathbb{N}, p \in (0,1)$: $X \left(\begin{array}{c} k \\ C_n^k p^k q^{n-k} \end{array} \right)_{k=\overline{0,n}}$;

Hint: A binomial $Bino(n,p)$ variable is the sum of n independent $Bern(p)$ variables;

c. Geometric Distribution $Geo(p)$, with parameter $p \in (0,1)$: $X \left(\begin{array}{c} k \\ pq^k \end{array} \right)_{k \in \mathbb{N}}$;

Hint: A geometric $Geo(p)$ variable represents the number of failures (i.e. the number of Bernoulli trials that ended up being failures) needed to get the first success;

d. Pascal Distribution $NB(n,p)$ with parameters $n \in \mathbb{N}, p \in (0,1)$: $X \left(\begin{array}{c} k \\ C_{n+k-1}^k p^n q^k \end{array} \right)_{k \in \mathbb{N}}$;

Hint: A Pascal $NB(n,p)$ variable is the sum of n independent $Geo(p)$ variables;