CSL003P1M: Probability and Statistics
Quiz II

December 20, 2021

Total Marks : 16   Duration: 1 hour   Maximum Marks : 15

1. Let X, Y and Z be independent geometric random variables with the same parameter p.
   Find $P\{X + Y \leq Z\}$. [4]

2. Suppose that a bag consists of b black and g green balls. A random sample of size r is taken without replacement. Let X be the random variable which denotes the number of black balls in the sample. Find $E[X]$ and $Var(X)$ using the formula for expectation and variance of sum of random variables. [1.5+2.5]

3. A box has 3 red balls and 2 black balls. A random sample of size 2 is drawn without replacement. Let U be the number of red balls selected and let V be the number of black balls selected. Compute $\rho(U, V)$. [4]

4. Let $X_1, \ldots, X_n$ be independent, identically distributed random variables such that $M_{X_1}(t)$ is finite for all t. Use moment generating functions to show that

$$E[(X_1 + \cdots + X_n)^3] = nE[X_1^3] = 3n(n-1)E[X_1^2]E[X_1] + n(n-1)(n-2)(E[X_1])^3$$

[4]