CS6015: Linear Algebra and Random Processes
Quiz - 7
Course Instructor : Prashanth L.A.
Date : Oct-27, 2017 **Duration** : 30 minutes

Name of the student :
Roll No :

INSTRUCTIONS: For true/false questions, you do not have to justify the answer. For the rest, provide proper justification for the answers. Please use rough sheets for any calculations *if necessary.* Please **DO NOT** submit the rough sheets. DO NOT use pencil for writing the answers.

1. True or False? Answer any five. $(2+2+2+2+2$ marks)

   Note: 2 marks for the correct answer and -1 for the wrong answer.

   (a) Let $\mathrm{Cov}(X,Y)$ denote the covariance of X and Y. If $\mathrm{Cov}(X,Y)=0$, then X and Y are independent.

   (b) If $\mathrm{Var}(X)=0$, then $\mathbb{P}(X=c)=1$ for some $c\in\mathbb{R}$.

   (c) There does not exist a r.v. X that satisfies $\mathbb{E}\left(\frac{1}{X}\right)=\frac{1}{\mathbb{E}(X)}$.

   (d) If $\mathbb{E}(X)<\infty$ then $\mathrm{Var}(X)<\infty$.

   (e) If $\mathrm{Var}(X)<\infty$ then $\mathbb{E}(X)<\infty$.

   (f) Let $\rho(X,Y)$ denote the correlation coefficient of X and Y. Then, for any a,b,c,d with $a>0, c>0$,
   $$\rho(aX+b,cY+d)=\rho(X,Y).$$

2. Let X and Y be independent r.v.s taking values $1,2,3,4$, each with probability $\frac{1}{4}$. Let $Z=\max(X,Y)$.

   Answer the following: (5+2+3 marks)

   (a) Write down the joint distribution of X and Z?

   (b) Find $\mathbb{E}(X)$ and $\mathbb{E}(Z)$.

   (c) Find $\mathrm{Cov}(X,Z)$.