Department of Mathematics, IIT Delhi

2301-MTL106: Quiz-II.

Time: 35 minutes **Date:** 01-11-2023 **Total Marks:** 10

"As a student of IIT Delhi, I will not give or receive aid in examinations. I will do my share and take an active part in seeing to it that others as well as myself uphold the spirit and letter of the Honour Code."

Q.1) Let X and Y be two random variables with joint moment generating function

$$m_{X,Y}(s,t) = \frac{1}{1-2t}\exp\left(\frac{s^2}{1-2t}\right), \quad t < \frac{1}{2}.$$

Find the covariance of X and Y. Are X and Y independent?–Justify your answer. 4+1 marks

Q.2) Decide if the following statement is true or false: (If true, provide a proof, if not provide a counter example)

Let $\{X_n\}$ and $\{Y_n\}$ be two sequence of random variable defined on the given probability space such that $P_{X_n} = P_{Y_n}$ i.e., for any Borel set $B \in \mathcal{B}(\mathbb{R})$, $\mathbb{P}(X_n \in B) = \mathbb{P}(Y_n \in B)$. Then X_n converges to 0 in probability implies Y_n converges to 0 in probability. 2 marks

Q.3) The number of accidents X at a particular space in Delhi that occur during a given month is found to have a mean of 12 and standard deviation of 2. Show the probability that, in the next month, X will be greater than eight but less than sixteen is at least $\frac{3}{4}$.

3 marks

Best of Luck!!!