Department of Mathematics, IIT Delhi

2301-MTL106: Quiz-I.

Time: 30 minutes **Date:** 17-08-2023 **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) A doctor assumes that a patient has one of three diseases $\mathcal{D}_1$, $\mathcal{D}_2$, or $\mathcal{D}_3$. Before any test, he assumes an equal probability for each disease. He carries out a test that will be positive with probability 0.8 if the patient has disease $\mathcal{D}_1$, 0.6 if the patient has disease $\mathcal{D}_2$, and 0.4 if the patient has disease $\mathcal{D}_3$. What is the probability that the test it positive? 2 marks

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

Let $(\Omega, \mathcal{F}, \mathbb{P})$ be a probability space and E, F, G are non-empty events. If E is independent of F and G, then E is independent of $F \cup G$. 4 marks

Q.3) Let X be a random variable with probability density function (pdf)

$$f_X(x) = \frac{1}{\sqrt{2\pi}} e^{-\frac{x^2}{2}}, \quad -\infty < x < \infty.$$

Find the pdf of $Y := e^X$ and the mean of Y.

2+2 marks

Best of Luck!!!