Department of Mathematics Minor 2 Examination

MTL 106: Probability and Stochastic Processes

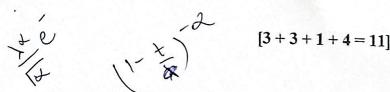
Venue: LH 121

Date: 04-10-2017

Time 2:30 - 3:30 PM

Full Marks: 22

- Q1. a) Suppose $X \sim \text{Exp}(10)$. Which of the following event has higher probability? E1 = $(X > 10 \mid X > 5)$ and E2 = $(X > 15 \mid X > 10)$. What do you conclude from there?
 - b) Suppose $X \sim Bin(100, p)$ and $Y \sim Bin(200, q)$ are independent, where p + q = 1. Find the distribution of X - Y. Justify your answer..
 - c) Let $X \sim \Gamma(1, n)$, where n > 0 is a real number. Find the MGF of X. Show that if $n \to \infty$ the MGF of standardized X asymptotically converges to the MGF of N(0,1).



- Q2. a) Let $\{X_n\}$ be a sequence of random variables, and X be another random variable defined on the same Ω . Suppose each X_n and X takes a constant value 10 with probability 1. Show that both $X_n \xrightarrow{P} X$ and $X_n \xrightarrow{L} X$ hold. Can we say the same if each X_n and X takes two values 5 and 10 with equal probabilities? Justify your answer.
 - b) Let $X \sim B_1(m, n)$ and $Y \sim \Gamma(\lambda, m+n)$ be independent. Find the distribution of XY, where λ , m, n > 0.