SI 417: Introduction to Probability Theory
Indian Institute of Technology Bombay
Quiz 2

Time: **35 minutes**   Marks: **5**

Instructor: **S. Baskar**   Date: **14-10-2020**

Instructions:

1. Write your **Name** and **Roll Number** on the first page of the file.
2. The answer to each question should start on a new page. If the answer for a question is split into two parts and written in two different places, the first part alone will be corrected.
3. The question paper contains 2 questions. **Answer at least 1 question**.
4. Only hand written answers will be considered (written by the student only). The tutorial marks will be considered only after matching the hand writing with the final exam answer booklet of a student.
5. Scan the answers in a single pdf file and email to baskar.iitb@gmail.com. File name should be <Roll number>.pdf (Ex. 19d00456.pdf).
6. Follow all instructions given by the instructor through emails. Violation of any instruction can result in getting zero mark.

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1. Let $X \sim \mathcal{N}(\mu, \sigma^2)$.

   i) Find the probability density function of $Y = e^X$.   (**1 Mark**)

   ii) Find the constants a and b such that $Y = a + bX$ has the standard normal distribution.   (**2 Marks**)

   iii) Show that $\mathbb{P}\big(\{|X - \mu| \leq \sigma\}\big) = K$, where K is a constant independent of μ and σ.   (**2 Marks**)

2. Let X and Y be independent binomial random variables with parameters (m, p) and (n, p), respectively, and let $Z = X + Y$. Show that the conditional probability mass function $f_{X|Z}(x|z)$ is hypergeometric. What are the parameters?