NATIONAL OPEN UNIVERSITY OF NIGERIA
Plot 91, Cadastral Zone, Nnamdi Azikwe Expressway, Jabi, Abuja.
FACULTY OF SCIENCES
SEPTEMBER Examination 2020_1

Course Code: STT 311
Course Title: Probability Distribution II
Credit Unit: 3
Time Allowed: 3 Hours
Instruction: Attempt Question One (1) and Any Other Four (4) Questions

1. (a) Explain clearly the term "random variables" **(2 marks)**

  (b) Define the following; (i) Sample Space **(3 marks)**

        (ii) Event Space **(2 marks)**

        (iii) Convergence to a random variable **(3 marks)**

  (c) Distinguish between; (i) Discrete random variables and **(3 marks)**

        (ii) Continuous random variables **(3 marks)**

  (d) State when a sequence of random variables $\{X_n\}$ is said to:
        (i) Converge in distribution **(3 marks)**
        (ii) "Converge in probability"(weakly) to the constant C **(3 marks)**

2. (a) Define the characteristic function of a random variable x **(4 marks)**

  (b) List four properties of characteristic function of a random variable x **(8 marks)**

3. (a) State the Central Limit theorem **(3 marks)**

  (b) A random variable x has a density function given by

  $$f(x) = \begin{cases} 2e^{-2x}, & x \geq 0 \\ 0, & x < 0 \end{cases}$$

  Find the moment generating function **(9 marks)**

4. (a) State the weak law of large numbers **(3 marks)**

  (b) Find the variance of the sum obtained in tossing a pair of fair dice **(9 marks)**

5. (a) Let x be a continuous random variable with density function $f(x)$;
   Define the expectation of x **(3 marks)**

   (b) If x is the number of points roll with a balance die, that is $F(x) = \frac{1}{6}$,
   for $x = 1, 2, 3, 4, 5, 6$. Find the mathematical expectation $E(x)$ of x **(9 marks)**

6. (a) Let x be a discrete random variable with probability density function $f(x)$;
   Define the expected value of x, $E(x)$ **(3 marks)**

   (b) Assume x to be a continuous random variable; Find the expectation of
   $g(x) = x^2$ for the number of points roll with a balance die,
   i.e. $F(x) = \frac{1}{6}$, for $x = 1, 2, 3, 4, 5, 6$. **(9 marks)**