

**NATIONAL OPEN UNIVERSITY OF NIGERIA**

**Plot 91, Cadastral Zone, Nnamdi Azikiwe Expressway, Jabi, Abuja.**

**FACULTY OF SCIENCES**

**January\February Examination 2018**

**Course Code: STT311**

**Course Title: Probability Distribution II**

**Credit Unit: 3**

**Time Allowed: 3 HOURS**

**Instruction: ATTEMPT NUMBER ONE (1) AND ANY OTHER FOUR (4) QUESTIONS**

1. (a) What is probability space? **(2 Marks)**

(b) A Statistics student who does not believe in hard work wants to make money and achieve

success in life by playing lottery. This addicted gambler spins a wheel of fortune for several years and discovered that the experiment can be modelled in terms of a random variable X with density function



1. Find the value of that makes it a valid density function. **(4 Marks)**
2. What is the mean of the random variable  **(4 Marks)**

(c) In a statistical experiment, people throw their hats in a box then each picks up one hat at random. What is the expected value of, the number of people that get back their own hat? **(6 Marks)**

(d) If there are 2 people that threw their hats in that box, find the approximate value for the

expected number of people that get their hats back. **(6 Marks)**

2. (a) State any two axioms of probability. **(2 Marks)**

(b) Given that the a continuous random variable has the following probability density

function: 

Find and use it to evaluate  **(5 Marks)**

(c) The length of life measure in hours of a certain rate type of insect is a random

variable with probability density function:



If the amount of food measured in milligrams consumed in a lifetime by such an inset is defined by the function where is the length of life measured in hours, find the expected amount of food that will be consumed by an insect of this type. **(5 Marks)**

1. (a) The joint density for the random variablesand where is



Find the:

1. marginal densities and  **(3 Marks)**
2. conditional density  **(3 Marks)**

(b) (i) In a gambling game, a man paid N5 if he gets all heads or tails when three coins are

tossed and he will pay N3 if either one or two heads show. **(2 Marks)**

(ii) What is his expected gain? **(1 Mark)**

(iii) Do you think the game is fair according to your expected gain? Give reasons? **(3 Marks)**

4. (a) Define the moment generating function of a random variable  **(2 Marks)**

(b) Does moment generating function always exist? Give reason. **(4 Marks)**

(c)The P.M.F of a distribution is given as 

Find the moment generating function of the distribution and use it to obtain the mean.

**(6 Marks)**

5. (a) (i) Define a random variable and state the types of random variables that we have. **(2 Marks)**

(ii) Given that has the moment generating function 

Find  **(3 Marks)**

(b) (i) Define characteristic function of a random variable 

(ii)Mention one advantage of characteristic function over moment generating function.

1. If X is a random variable with an exponential with parameter.

Find the characteristic function. **(7 Marks)**

6. (a) (i) State Chebyshev’s inequality theorem **(2 Marks)**

(ii) Proof the Chebyshev’s inequality **(3 Marks)**

(b) (i) Define the term conditional probability. **(2 Marks)**

(ii) The joint density function of and is given as



Find the  **(5 Marks)**