NATIONAL OPEN UNIVERSITY OF NIGERIA
14/16 AHMADU BELLO WAY, VICTORIA ISLAND, LAGOS
SCHOOL OF SCIENCE AND TECHNOLOGY
MARCH/APRIL 2014 EXAMINATION

COURSE CODE: STT311
COURSE TITLE: PROBABILITY DISTRIBUTION II
TIME ALLOWED: 3HOURS
INSTRUCTION: COMPLETE ANSWERS TO ANY FIVE (5) QUESTIONS BEAR FULL MARKS

1. (a) In an experiment involving tossing a fair coin thrice, if t is a random variable representing
the number of head that turns up.
Draw a graph representing the distribution function of this experiment? 6marks

(b) In the experiment 1(a) , if y is a random variable representing the number of tails
that turns up.
(i) Find the probability of having two tails
(ii) Find the probability of having no tail
(iii) Find the probability of having three head
(iv) Find the probability of having a single head
4marks

(c) Find the value of the constant K such that the integral of

$$\int_0^3 \frac{k(7x+8)}{2x^2+11x+5} \quad \text{is a pdf}$$

4marks

2(a) Define Central limit theorem for independently and identically distributed (iid) random variable X and determine its moment generating function(Mgf). 4marks

(b) The joint density function of two continuous random variables x and y is

$$f(x,y) = \begin{cases} Cxy & 0<x<4, 1<y<5 \\ 0 & otherwise \end{cases}$$

(i). Find the value of the constant C
3marks
(ii). Find $P(1 < x < 2, 2 < y < 3)$
4marks
(iii). Find $P(x \geq 3, y \leq 3)$.
3marks

3 (a) The error involved in measuring the length of a table is a continuous random variable x with the pdf

$$\frac{100}{16086933}\int_0^2 (5x+3)^5 dx$$

Find P(x>1) 6marks

(b) Define probability Measure indicating relevant properties.
4marks

(c) The probability function of a random variable x is given by f(x)

[illegible]

$x = 1$
$x = 2$
$x = 3$
$otherwise$

Where p is a constant, find

(i) The value of p
(ii) P(0≤x<3)
(iii) P(x>1)
4marks

4. (a) Show that the sequence X_n of random variable is said to converge
(i) In mean square to Random Variable X. 4marks
(ii) With probability one almost surely to a constant c. 4marks

(b) State and Prove Central limit Theorem. 6marks

5. (a) Define a continuous random variable on a probability space
7marks

(b) The length of life measure in hours of a certain rare type of insect is a random variable x with portability density function

$$f(x) = \begin{cases} \frac{3}{4}(2x - x^2) & 0<x<2 \\ 0 & elsewhere \end{cases}$$

If the amount of food measured in milligrams consumed in a life time by such an insect defined by the function $g(x) = x^2$, *where x is the length of life measured in hours*, find the expected amount of food that will be consumed by an insect of this type.
7marks

6 A pair fair dice is tossed. We obtain the finite equiprobable space consisting of the 36 ordered pairs of numbers between 1 and 6, given as
S = ((1,1), (1,2), . . . , (6,6)}. Let X assign to each point (a,b) in S, the maximum of its numbers i.e X(a,b) = max(a,b). Then

i) Show that X is a random variable with the image set X(S) = {1, 2, . . . , 6} 2marks

ii) Compute the distribution f(x) 2marks

iii) Compute also the expected value of X 2marks

iv) Compute the expected value of Y, if Y assigns to each point (a,b) in S, the sum of its numbers a+b. 4marks

v) Indicate the g(y) graphically. 4marks .

7 (a) State and prove CHEBYSHEV’S INEQUALITY for a continuous random variable. 7marks

(b) State and prove DEMOVRE’S THEOREM 7marks