NATIONAL OPEN UNIVERSITY OF NIGERIA
14-16 AHMADU BELLO WAY, VICTORIA ISLAND LAGOS
SCHOOL OF SCIENCE AND TECHNOLOGY
MAY/JUNE 2012 EXAMINATION

STT 311 STATISTICS
TIME ALLOWED: 3 HOURS

TOTAL: 100%

INSTRUCTION: COMPLETE ANSWERS TO ANY FIVE (5) QUESTIONS BEAR FULL MARKS

1(a) Define probability Measure indicating relevant properties. 8marks

1(b) Let A_n be a sequence of independent measurable sets, show that
(i) If $\sum P(A_n)$ then $P(A_i)$

(ii) If $\sum_{1} P(A_n) =$ then P (A.) = 1
where A_1 = Lim sup An 12marks

2(a) Define a continuous random variable on a probability space
8marks

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

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

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.-12marks

3(a) Find the constant C such that the function

$$f(x) = \begin{cases} Cx^2 & 0 < x < 3 \\ 0 & \text{Elsewhere} \end{cases}$$

Is a density function.

3(b) Find the probability density function $f_X(x) = \begin{cases} 2x & 0<x<1 \\ 0 & \text{Otherwise} \end{cases}$ -10marks

4(a) Define Central limit theorem for independently and identically distributed (iid) random variable X and determine its moment generating function(Mgf). 10marks

4(b) A random variable x has the density function

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(1) $f(x) = \frac{C}{X^2+1}$ where }∘× χ

a. Find the value of the constant C

b. Find the probability that X^2 lies between 1/3 and 1 -10marks

5 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}
ii) Compute the distribution f(x)
iii) Compute also the expected value of X
iv) Compute the expected value of Y, if Y assigns to each point (a,b) in S, the sum of its numbers a+b.
v) Indicate the g(y) graphically. -4marks each.

6 The joint probability function of two discrete random variable X and Y - 1 is given by $f(x, y) = C(2x + y)$, *where x and y can* assume all integers such that $0 \le x \le 2, 0 \le y \le 3$, *and* $f(x, y) = 0$ *otherwise*

a. find the value of the constant C

b. Find p (x = 2, y = 1).

(c) find p (x >1, y < 2

7 (a) What Is Expectation of Random Variables?

(b) Let X and Y be random variables on the same sample space S. Show that

E(X + Y) = E(X) + E(Y).

(c) Define rth moment of a random variable X about the mean μ.