NATIONAL OPEN UNIVERSITY OF NIGERIA
14-16 AHMADU BELLO WAY, VICTORIA ISLAND, LAGOS
SCHOOL OF SCIENCE AND TECHNOLOGY
JANUARY/FEBRUARY 2013 EXAMINATION

CODE: **STT 311**

TITLE: **STATISTICS** **CREDIT UNIT: 3**

INSTRUCTION: **COMPLETE ANSWERS TO** **TIME: 3 HOURS**

ANY FIVE (5) QUESTIONS BEAR FULL MARKS
TOTAL: 70%

1(a) **Define a continuous random variable on a probability space -4marks**

1(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. -10marks**

2(a) **Define Central limit theorem for independently and identically distributed (iid) random variable X and determine its moment generating function(Mgf). -7marks**

2(b) **A random variable x has the density function , .**

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

i. Find the value of the constant C
ii. Find the probability that X^2 lies between 1/3 and 1 -7marks

3 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 $o \le x \le 2$, $o \le y \le 3$, *and* $f(x, y) = o$ *otherwise*

a. find the value of the constant C

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

(c) find p (x >1, y < 2) -14marks

4(a) Define probability Measure indicating relevant properties. -6marks

4(b) Let $\{A_i\}$ be a sequence of independent measurable sets, show that

(i) If $\sum P(A_i) < \infty$ then $P(A_n) = 0$

(ii) If $\sum P(A_i) = \infty$ then P (A.) = 1

where A1 = Lim sup An -8marks

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

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

is a density function.

5(b) Find the probability density function

$$Fx(x) = \begin{cases} 2x & 0<x<1 \\ 0 & \text{Otherwise} \end{cases}$$

-10marks

6(a) What Is Expectation of Random Variables?

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

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

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

7 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.**

-14marks each.

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