

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 An be a sequence of independent measurable sets, show that (i) If $\sum P(An)$ then P(Ai).

(ii) If
$$\sum_{i} P(An_i) = \text{then } P(A.) = 1$$

where $A_1 = \text{Lim sup An}$

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

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

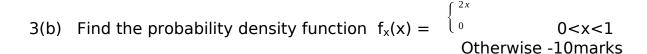
If the amount of food measured in milligrams consumed in a life time by such an insect defined by the function g $\tilde{I}x\tilde{Y}^*c x^2$, where x is the length of life measured in hours, find the expected amount of food that will be consumed by an insect of this type.-12marks

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

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

Elsewhere

Is a density function.



- 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

, .

$$\frac{C}{X+1}$$
 where 3°

- a. Find the value of the constant C
- b. Find the probability that X^2 lies between 1/3 and 1 -10marks
- 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 $S = ((1,1), (1,2), \ldots, (6,6))$. 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. each.

-4marks

- The joint probability function of two discrete random variable X and Y 1 is given by $f(x, y) \stackrel{*}{\sim} C(2x \nmid y)$, where x and y can assume all integers such that $o(x \mid 2, o(y \mid 3), and f(x, y) \stackrel{*}{\sim} o(x \mid y)$
 - 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 .