(Knowledge for Development)

KIBABII UNIVERSITY

UNIVERSITY EXAMINATIONS

2017/2018 ACADEMIC YEAR

SECOND YEAR FIRST SEMESTER

SPECIAL/ SUPPLEMENTARY EXAMINATION

FOR THE DEGREE OF BACHELOR OF SCIENCE

MATHEMATICS

COURSE CODE: STA 211

COURSE TITLE: STATISTICS AND PROBABILITY

DATE: 18/10/18 **TIME:** 8 AM -10 AM

INSTRUCTIONS TO CANDIDATES

Answer Question One and Any other TWO Questions

TIME: 2 Hours

QUESTION ONE : 30 MARKS

(a) Differentiate between the following terms as used in statistics

(i) A discrete and continuous random variable. (2 mks.)

(ii) A sample point and a sample space (2 mks.)

(iii) A population and a sample (2 mks.)

(b) A random variable x has the following probability distribution

X	0	1	2	3	4	5	6	7	8
P(X=x	a	3a	5a	7a	9a	11a	13a	15a	17a

(i) Find the value of a (3 mks.)

(ii) Complete P $(X < 3)$, $P\ (X \geq 3)$, $P\ (0 < x < 5)$ (6 mks.)

(c) Let X be a r . v with pdf given as

$$fx = \begin{cases} \frac{x}{10} & , x = 1,\ 2,\ 3,\ 4 \\ 0 & , \text{elsewhere} \end{cases}$$

Compute

(i) $E(X)$ (3 mks.)

(ii) $E(X^2\ )$ (3 mks.)

(iii) $E(5x^3\ -\ 2x^2\ )$ (3 mks.)

(d) Let x be a random variable with a hypergeometric distribution. , Write down the pdf of x (2 mks.)

(e) A committee of 4 people is to be selected at random from among 10 people of whom 3 are women

And 7 men. Let x denote the number of women selected.

Determine:

(i) The probability distribution of x (2 mks.)

(ii) The mean and variance of x (4 mks.)

QUESTION TWO: 20 MARKS

(a) What is factorial moment generating function? (1 mk.)

(b)(i) Find the factorial moment generating function of the binomial distribution. (3 mks.)

(ii) Use the results in (i) above to find the mean and variance of x (12 mks.)

(c) Assuming that 2 in 10 automobile accidents are due mainly to driver fatigue; Find the probability that

among 8 automobile accidents, 3 will be due to mainly driver fatigue. (4 mks.)

QUESTION THREE: 20 MARKS

(a) Let x be a random variable whose pdf is given by

$$f(x) = \frac{e^{-\lambda}\lambda^{x}}{x!}, x = 0, 1, 2 - - - - - - - - -$$

Show that the mean and variance of x are both λ (10 mks.)

(b) In a region, the number of persons who become seriously ill each year from eating a given kind of

Poisonous plant is a random variable having poison distribution with λ = 1.6

(i) 2 such illness in a given year (3 mks.)

(ii) At least 7 such illness in 5 years. (3 mks.)

(c) A random variable x has a pdf given as

$$f(x) = \begin{cases} kx^2, & -1 < x < 2 \\ 0, & \text{elsewhere.} \end{cases}$$

(i) Find k (2 mks.)

(ii) $P(0 < x \leq 1)$ (2 mks.)

QUESTION FOUR: 20 MARKS

(a) If x ~ $N(10, \delta)$ and $P(X > 12) = 0.1587$ determine $P(9 < x < 11)$ (4 mks.)

(b) A random variable x is normally distributed with mean
$\cup$ and variance δ^2. Determine the mean

And variance of a new random variable Y = e^x (4 mks.)

(c) A random variable x is distributed as

$$f(x) = \begin{cases} k\sqrt{x} \ , & 0 < x < 1 \\ 0 \ , & \text{elsewhere} \end{cases}$$

(i) Find the value of k (3 mks.)

(ii) Complete $E(X)$ and $Var(X)$ (5 mks.)

(d)A man participating in an archery tournament is continuously trying to hit a taeget. What is the probability that his tenth trial is his fifth hit, if the probability of hitting the target at any trial is $\frac{1}{2}$

(4 mks.)

QUESTION FIVE : 20 MARKS

(a) Let x be a discrete random variable with pdf

$$f(x) = \begin{cases} \frac{1}{20}(x+1) \ , & x \ ,= 1, \ 2 \ ,3 \ 4 \ 5 \\ 0 & \text{elsewhere} \end{cases}$$

(i) *Sketch the graph of* $f(x)$. (4 mks.)

(b)*A random variable x is distributed as*

$$f(x) = \begin{cases} \frac{1}{2^{x+1}} \ , & x = 0, \ 1, \ 2 \\ 0 & elsewhere \end{cases}$$

Find the moment generating function of x hence complete $E(X)$. (5 mks)

(c) *If 2% of the fuses delivered to an organisation are defective, using poison approximation, what is the probabilityt that a random sample of 400 of the fuses will contain exactly 6 defectives.* (11mrks)