ALUPE UNIVERSITY COLLEGE

...Bastion of Knowledge....

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OFFICE OF THE DEPUTY PRINCIPAL
ACADEMICS, STUDENT AFFAIRS AND RESEARCH

UNIVERSITY EXAMINATIONS

2018 /2019 ACADEMIC YEAR

FIRST YEAR SECOND SEMESTER REGULAR EXAMINATION

FOR THE DEGREE OF BACHELOR OF SCIENCE (APPLIED STATISCTICS WITH COMPUTING)

COURSE CODE: **STA 112**

COURSE TITLE: **PROBABILITY AND STATISTICS II**

DATE: 16/4/2019 **TIME: 2.00 PM - 5.00 PM**

INSTRUCTION TO CANDIDATES

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STA 112: PROBABILITY AND STATISTICS II

STREAM: ASC **DURATION: 3 Hours**

INSTRUCTION TO CANDIDATES

Answer **ALL** questions from section A and any **THREE** from section B.

SECTION A

QUESTION ONE[15 mks]

a) Define the following terms as used in statistics

i) Discrete random variable [2 mks]

ii) Continuous random variable [2 mks]

iii) Bernoulli distribution [2 mks]

b) If x has the probability density

$$f(x)=\begin{cases} k.e^{-3x} & for \quad x>0 \\ 0 & elsewhere \end{cases}$$

i) Find k and hence [2 mks]

ii) P(0.5<x<1) [2 mks]

c) Given that x has the probability distribution $f(x)=\begin{cases} \frac{1}{8}\binom{3}{x} \\ 0, elsewhere \end{cases}$ for x= 0, 1, 2 and 3. Find the moment generating function of this random variable and use it to determine μ_1' and μ_2'

[5 mks]

QUESTION TWO [16 mks]

a.) Briefly explain the following terms

i.) Random variable [1mk]

ii.) Probability function [2 mks]

iii.) Probability distribution [2 mks]

b.) Let X be a random variable with the following probability distribution

$$f(x)=\begin{cases} \frac{1}{18}(3+2x) \\ 0, \text{elsewhere} \end{cases} \qquad \text{for } 2\leq X\leq 4$$

i.) Verify that it is a pdf [2 mks]

ii.) Find the pr($2 \leq x \leq 3$) [2 mks]

iii.) Find F(x) [2 mks]

iv.) Obtain the expectation and the variance of x [4 mks]

v.) What is the standard deviation of x [1 mk]

SECTION B (39 MARKS)

QUESTION THREE (13 MARKS)

a) A company estimates that the net profit if a new product in its launching is to be 3 million shillings during the first year, if it's successful, 1 million if it's moderately successful and a loss of 1 million if it's unsuccessful. Company assigns the following probability to the first year prospect for the product if successful 0.15 , moderately successful 0.25, and unsuccessful 0.60

i.) What is the probability distribution? [1 mk]

ii.) Find the mean and variance [4 mks]

b.) Find the first four moments about the origin for the random variable X having density functions

$$f(x) = \begin{cases} 4x(9-x^2)/81, & 0 \leq x \leq 3 \\ 0, & elsewhere \end{cases}$$ [4 mks]

c.) The distribution function for a random variable X is

$$F(x) = \begin{cases} 1 - e^{-2x} & x \geq 0 \\ 0, & x < 0 \end{cases}$$

Find i) Derive the p.d,f of this cumulative distribution function [2 mks]

ii) Show that the derived function is actually a p.d.f [2 mks]

QUESTION FOUR (13 MARKS)

a) Find the mean and variance of a Poison distribution [5 mks]

b) A survey conducted in a given country shows that the average numbers of accidents in an industry is 1.1 per 500 employees. Find the probability that in a given year;

i.) No accidents occurs [2mks]

ii.) At least one accident occurs [2 mks]

c) Use the moment generating function technique to find the mean and variance of the poisson distribution [4 mks]

QUESTION FIVE (13 MARKS)

a) The mean number of the defects /flaw per 10m length of the fabric material is 2. If the flaw occurs randomly find the probability that in

i.) 20m length of the material there will be more than one flaw. [1mk]

ii.) 25m length of the material there will be exactly two flaws [2 mks]

b) Given the p.d.f

$$f(x)=\begin{cases}\frac{1}{18}(2x+3), & 2\leq x\leq 5\\ 0, & elsewhere\end{cases}$$

Find the mean [4 mks]

c) Find the moment generating function of a binomial distribution hence find the mean and variance. [6 mks]

QUESTION SIX (13 MARKS)

a) A continuous random variable have a pdf

$$f(x)=\begin{cases}k(x^2-2x+3 & 0\leq X\leq 2\\ 0, & elsewhere\end{cases}$$

Find the value of k.

[2mks]

b) The p.d.f $f(x)=\begin{cases}3e^{-3X} & x>0,\\ 0, & elsewhere\end{cases}$

Find the moment generating function and hence the mean and variance of X [6mks]

c) i) A fair coin is tossed twice let x be the number of heads. Find the first three moments about the origin hence [2mks]

ii) Find the mean and variance [3mks]

QUESTION SEVEN (13 MARKS)

a) Define bivariate function of x and y [1 mk]

b) Given the joint probability density function $f(x,y)=\begin{cases}\frac{3}{5}x(y+x) & \text{for } 0<x<1,\ 0<y<2\\ 0, & \text{elsewhere}\end{cases}$

i.) Show that f(x,y)is a bivariate p.d.f [2 mks]

ii.) Find the marginal density function of x and y [4 mks]

iii.) Find the cov (x,y) [4 mks]

iv.) Are X and Y stochastically independent [2 mks]

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