(*Knowledge for Development*)

KIBABII UNIVERSITY

UNIVERSITY EXAMINATIONS

2017/2018 ACADEMIC YEAR

SECOND YEAR SECOND SEMESTER

MAIN EXAMINATION

FOR THE DEGREE OF BACHELOR OF SCIENCE

COURSE CODE: **STA 211**

COURSE TITLE: **PROBABILITY AND STATISTICS II**

DATE: 08/08/18 **TIME: 9 AM -11 AM**

INSTRUCTIONS TO CANDIDATES

Answer Question One and Any other TWO Questions

TIME: 2 Hours

This Paper Consists of **4 Printed Pages**. Please Turn Over.

QUESTION ONE: 30 MARKS

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

(i) A population and sample (2 mks)

(ii) A discrete and continuous random variable (2 mks)

(b) A random variable x has pdf given by

$$f(x) = \begin{cases} cx^2 , & 0 < x < 1 \\ 0 , & Otherwise \end{cases}$$

Where C is a constant

(i) Determine the value of C (2 mks)

(ii) Compute P $\left[{}^{1}/_{4} < x \leq {}^{1}/_{2} \right]$ (3mrks)

(c) An experiment succeeds twice as often as it fails. Find the chance that in the next six trials there will be at least 4 successes (6mrks)

(d) A random variable x has a continues pdf given by

$$\mathrm{f(x)} = \begin{cases} \lambda e^{-\lambda x} , & 0 < x < \infty \\ 0 , & \text{elsewhere} \end{cases}$$

(i) Determine the moment generating function of x (5 mks.)

(ii) Use the mgf obtained in (i) above to complete E(x) and var (x) (6 mks.)

(e) A lot of size 100 contains 50 defective articles, suppose that articles are drawn at random from the lot Without replacement. Calculate probability that the sample contains less than 3 defectives.

(4 mks.)

QUESTION TWO: 20 MARKs

(a)The life of LED bulbs of a certain brand may be assumed to be normally distributed with mean 155 days and standard deviation 19. What is the probability

i. That the life of a randomly chosen LED bulb is less than 117 days (5mrk)
ii. That the total life of a randomly chosen LED bulb is between 136 days and 174 days (3mrks)

(b) State and prove Markov's inequality. (9 mks)

(c) A die is thrown until a side with a six appears. Find the probability that it must be thrown more than four times? (3mrks)

QUESTIUON THREE : 20 MARKS

(a) A large shipment of books contains 2 percent with imperfect bindings. Use the poison approximation

Of binomial distribution to determine the probability that among 600 books

(i) At most 15 will have imperfect bindings (3 mks)

(ii) Exactly 15 will have imperfect bindings (3 mks)

(iii) At least 10 will have imperfect bindings (3 mks)

(b) A random variable x is normally distributed with mean μ and variance ∂^2 . Determine

(i) E (x) (2 mks)

(ii) Var (V) (3 mks)

of a new random variable $Y = e^x$

(C) If a random variable x has a uniform distribution over (-4, 4). Then, find m for which

$P[X > m] = \frac{1}{4}$. Also compute $P[-3 < X < 3]$ (4mks)

QUESTION FOUR : 20 MARKS

(a) Let x be a r.v .define the factorial moment generating function of x? (1mk)

(b) A discrete random variable x has a pdf given by

$$f(x) = \begin{cases} (\frac{1}{3})^x(\frac{2}{3}), x = 0,1,2 \\ 0 elsewhere \end{cases}$$

Determine the factorial moment generating function of x. Hence compute E(X) and Var (x)

(14 mks.)

(c) If x is a r.v such that E(X) = 3 and $E(X^2) = 13.$ *Use chebyShevs equality to determine a lower* bond for the probability $\Pr(-2 < x < 8)$ (5 mks.)

QUESTION FIVE : 20 MARKS

(a) Let x be a r.v. , if x have a negative binomial distribution, write down the pdf of x (2 mks.)

(b) If the probability of baring a male or a female child are both 0.5 calculate the probability that

(i) A family's 5^{th} child is the 1^{st} son. (3 mks.)

(ii) A family's 8^{th} child is the 3^{rd} son (3 mks.)

(iii) A family's 6^{th} child is the second or third son, (5 mks.)

(c) Differentiate between a sample space and a sample point. (2 mks,)

(d) Let x be a continuous r.v. show that the function

$$f(x) = \begin{cases} \frac{1}{2}x , & 0 \leq x \leq 2 \\ 0 , & Otherwise \end{cases}$$

Is a probability function. Hence calculate

$P\left(\frac{1}{2} \leq X \leq 1\right)$ (5 MKS.)

THE END