

Mount Kenya



University

UNIVERSITY EXAMINATION 2015/2016

SCHOOL OF PURE AND APPLIED SCIENCES
DEPARTMENT OF MATHEMATICS, STATISTICS AND ACTUARIAL SCIENCE

BED (SCIENCE), BED (ARTS) AND BSNE
SCHOOL BASED

UNIT CODE: BMA2102

UNIT TITLE: PROBABILITY & STATISTICS II

DATE: DECEMBER 2015

MAIN EXAM

TIME: 2 HOURS

Instructions: Answer question one and any other two

SECTION A (30 MARKS)

1.

a. Explain the following terms

- i. Event (3 marks)
- ii. Discrete variable (3 marks)
- iii. Continuous variable (3 marks)
- iv. Pdf (3 marks)
- v. Random variable (3 marks)

b. A coin is tossed three times. If X is a random variable showing the number of heads that come up, construct a probability distribution of X . (6 marks)

c. Obtain the probability function from the distribution function

X	1	2	3	4
$f(x)$	$1/8$	$3/8$	$3/4$	1

Hence determine;

- i. $P(1 \leq x \leq 3)$ (3 marks)
- ii. $P(x \geq 2)$ (3 marks)
- iii. $P(x < 3)$ (3 marks)

SECTION B (20 MARKS)

2.

- a. A random variable X has the density function $f(x) = \frac{c}{x^2+1}$, where $-\infty < x < \infty$
 - i. Find the value of the constant (4 marks)
 - ii. Find the probability that x^2 lies between 1/3 and 1. (6 marks)
- b. Give the relationship between Poisson and Binomial distributions (10 marks)

3. Prove that the moment generation function results in a Taylor series function (20 marks)

4. Find the expectation of a discrete random variable X whose probability function is given by $f(x) = \begin{cases} \frac{1}{2} & , x = 1, 2, 3.. \\ 0, & otherwise \end{cases}$

Find;

- a. The variance (10 marks)
- b. The standard deviation of the sum obtained in tossing a pair of fair dice (10 marks)

5.

a. Given $f(x) = \begin{cases} \frac{1}{4} & , -2 \leq x \leq 2, \\ 0, & otherwise \end{cases}$ find

- i. Variance (4 marks)
- ii. Standard deviation (6 marks)

a. A random variable X has density function given by $f(x) = \begin{cases} 2e^{-2x}, & x \geq 0 \\ 0, & otherwise \end{cases}$

- b. Find the moment generating function (5 marks)
- c. The first four moment about the origin (5 marks)