



(Knowledge for Development)

KIBABII UNIVERSITY COLLEGE

**A CONSTITUENT COLLEGE OF MASINDE MULIRO UNIVERSITY OF
SCIENCE AND TECHNOLOGY**

UNIVERSITY EXAMINATIONS

2014/2015 ACADEMIC YEAR

THIRD YEAR SECOND SEMESTER

MAIN EXAMINATION

FOR THE DEGREE OF BACHELOR OF SCIENCE

AND BACHELOR OF EDUCATION

COURSE CODE: STA 142

COURSE TITLE: INTRODUCTION TO PROBABILITY

DATE: 27/4/15

TIME: 8AM -10 AM

INSTRUCTIONS TO CANDIDATES

Answer Question One in and Any other TWO Questions

TIME: 2 Hours

This Paper Consists of 6 Printed Pages. Please Turn Over.

QUESTION ONE (16MARKS)

a) Distinguish between the following terms as used in probability(6marks)

- (i) Mutually exclusive events and independent events
- (ii) Discrete random variable and Continuous random variable
- (iii) Probability distribution function and Distribution function
- (iv) Favorable events and equally likely events.

b) Events C and D are such that $P(C) = 19/30$, $P(D) = 2/5$ and $P(C \cup D) = 4/5$. Find $P(C \cap D)$ (3marks)

c) If A, B,C are independent events. Prove that A, and $B \cup C$ (3marks)

d) List three ways in which a set can be specify (3marks)

e) The discrete random variable W has probability distribution as shown

w	-3	-2	-1	0	1
$P(X=x)$	0.1	0.25	0.3	0.15	d

Find

- i. The value of d
 - ii. $P(W > -1)$
 - iii. The mode (5marks)
- f) The continuous random variable has p.d.f $f(x) = 1/20(x + 3)^2$ for $0 \leq x \leq 4$.
- i. Find $E[X]$ (3marks)
 - ii. Find $E[2X + 5]$ (2marks)
 - iii. Find $E[x^2]$ (3marks)

- iv. Find $E[X^2 + 2X - 3]$ (2marks)

QUESTION TWO (20MARKS)

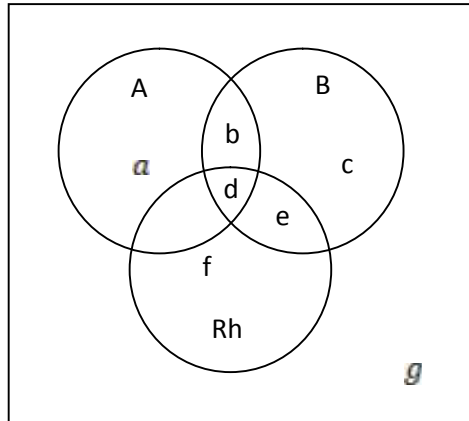
- a) State and prove Baye's Theorem (7mark)
- b) Three Urns of the same type have the following number of balls.
- First urn: 2 black 1 white
 - Second urn: 1 black 2 white
 - Third urn: 2 black 2 white

One of the urns is selected and one ball is drawn. It turns out to be white. What is the probability of drawing a white ball again, the first one not having been returned? (4marks)

- c) A group of girls at a school are entered for Advanced Level mathematics models. Each girl takes only module M_1 or module M_2 or both M_1 and M_2 . The probability that a girl is taking M_2 given that she is taking M_1 is $1/5$. The probability that a girl is taking M_1 given that she is taking M_2 is $1/3$. Find the probability that
- i. A girl selected at random is taking both M_1 and M_2 (6marks)
 - ii. A girl selected at random is taking only M_2 (3marks)

QUESTION THREE (20MARKS)

- a) Human blood can contain either no antigen, the antigen, the B antigen, or both the A and B antigen. A third antigen called the Rh antigen, is important in human reproduction and again may or may not be present in an individual blood is called type A – positive if the individual has the A and Rh, but not the B antigen. A person having only the A and B antigen is said to have type AB – negative blood. A person having only the Rh antigen has type O – positive blood. Other blood types are defined in a similar manner. Use the Venn diagram below to identify the blood type of the individuals in each region of the Venn diagram.



Identify;

i). a

ii). b

iii). c

iv). D

v). e

vi). f

vii)g

(7 Marks)

b) Use a Venn diagram to shade each of the following set

i. $(A \cap B')C'$

ii. $(A' \cap B') \cup C'$

(2marks)

c) Let a random variable X have a function.

$$f(x) = 2e^{-2x} \quad x > 0$$

(i) Verify whether $f(x)$ is a probability density function or not. (3marks)

(ii) Find the probability that $x > 2$. (3marks)

d) A random variable X has the density function

$$f(x) = \frac{c}{x^2+1} \quad -\infty < x < \infty$$

- (i) Find the value of the constant c (3marks)
- (ii) Find the probability that x lies between 1 and 2. (2marks)

QUESTION FOUR (20 MARKS)

- a) State the difference between permutation and combination. (2marks)
- b) The customer buys 20 resistors and tests four of them. In how many different ways can he pick the samples of four? (3marks)
- c) Find the number of distinct permutations that can be formed from the words
- SOCIOLOGICAL
 - UNUSUAL (2marks)
- d) In an examination 30% of students have failed in mathematics, 20% of the students have failed in chemistry and 10% have failed in math and chemistry. A student is selected at random. What is the probability that;
- The student has failed in mathematics if its known that he has failed in chemistry (3marks)
 - The student has failed either in mathematics or chemistry (3marks)
- e) There are three alternative proposal before a businessman to start a new project.
- Proposal A: profit of Ksh 5M with a probability of 0.6 or a loss of ksh 80,000 with a probability of 0.4.
 - Proposal B: profit of Ksh 10M with a probability of 0.4 or a loss of ksh 200,000 with a probability of 0.6.
 - Proposal C: profit of Ksh 4.5M with a probability of 0.8 or a loss of ksh 50,000 with a probability of 0.2.

If he wants to maximize the profit and minimize the loss, which proposals should he prefer? (6marks)

QUESTION FIVE (20MARKS)

a) Anne plays a game in which a fair six-sided die is thrown once. If the score is 1,2,or 3, Ann loose \$10. If the score is 4 or 5, Ann wins\$ x. if the score is 6,Ann wins \$2x

- i. Show that the expectation of Anne's profit is $\$(2/3- 5)$ in a single game.(4marks)
- ii. Given that $x=12$, calculate the standard deviation of Anne's profit in a single game(6marks)

b) A random variable X has a probability density function

$$f(x) = \begin{cases} Ax(6-x)^2 & 0 < x < 6 \\ 0 & \text{otherwise} \end{cases}$$

Find the value of the constant A (2marks)

- i. Calculate
 - a. the mean (2marks)
 - b. the mode (2marks)
- c. the standard deviation (4marks)