



EMBU UNIVERSITY COLLEGE
(A CONSTITUENT COLLEGE OF THE UNIVERSITY OF NAIROBI)

FIRST SEMESTER EXAMINATIONS 2014/2015

FIRST YEAR EXAMINATION FOR THE DEGREES OF BACHELOR OF SCIENCE
AND BACHELOR OF EDUCATION

SMA 101: BASIC MATHEMATICS

DATE: DECEMBER 11, 2014

TIME: 08:00 – 10:00AM

INSTRUCTIONS:

Answer Question ONE and ANY Other TWO Questions.

QUESTION ONE

a) Let $U = \{1, 2, 3, 4, 5, 6, 7\}$ be the universal set. Consider the sets $A = \{1, 4, 5\}$, $B = \{2, 3, 4, 5, 7\}$ and $C = \{1, 2, 3\}$. Find the following sets:

i) $A \cap B$ (1 mark)

ii) $A - B$ (3 marks)

iii) $(A \cup B \cup C)^c$ (2 marks)

b) Let f and g be two functions on $\mathbb{R} \rightarrow \mathbb{R}$ defined by $f(x) = \frac{4x-1}{2x+3}$ and $g(x) = \frac{2}{x+3}$

Determine

i) The domain of $f(x)$ (2 marks)

ii) The composite function $(f \circ g)(x)$ (4 marks)

iii) $f^{-1}(x)$, the inverse of $f(x)$ (4 marks)

c) Given that $\sin(\theta) = \frac{5}{13}$, $90^\circ \leq \theta \leq 180^\circ$, determine the value of $\tan(2\theta)$ (5 marks)

d) Express the complex number $Z = 2(\cos 120^\circ + i \sin 120^\circ)$ in rectangular form .

(2 marks)

- e) Waema, Rotich, Mochache and Nekesa are running for the offices of Chairman, Secretary and Treasurer. In how many ways can these offices be filled? (1 mark)
- f) Using the following simple statements:

$k = \text{kachumbari is extra,}$

$b = \text{the beans are included,}$

$c = \text{the chili peppers are optional,}$

Convert the following symbolic statements into words

- i) $(k \wedge c) \rightarrow b$ (3 marks)
- ii) $(\sim b) \rightarrow [(\sim k) \vee (\sim c)]$ (3 marks)

QUESTION TWO

- a) Determine the values of x , y and z if
 $(2x + 3y, 4x + 6y, 3x - 4z + 4) = (1, 3 + 4z, 3 - x)$ (7 marks)
- b) Let a set S be given by $S = \{x: x \in \mathbb{Z} \text{ and } x < 3\}$.
Re-present S by listing its elements (2 marks)
- c) Ninety people at an entertainment restaurant were surveyed to see what they ate while watching a soccer match. The following data was collected: 48 had pizza; 39 had lasagna; 35 had hot dogs; 20 had both lasagna and hot dogs; 19 had both hot dogs and pizza; 22 had both lasagna and pizza; 10 had pizza, lasagna and hot dogs
- i) Use a Venn diagram to represent this data (2 marks)
- ii) How many had nothing? (2 marks)
- d) For triangle ABC , $AB=60$ cm, $BC=80$ cm and $\angle ABC = 120^\circ$. Determine
- i) AC , correct to four decimal places (4 marks)
- ii) $\angle CAB$ (3 marks)