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# KIRIRI WOMENS' UNIVERSITY OF SCIENCE AND TECHNOLOGY
## UNIVERSITY EXAMINATION, 2016/2017 ACADEMIC YEAR
## FIRST YEAR, FIRST SEMESTER EXAMINATION
## FOR THE DEGREE OF BACHELOR OF SCIENCE
## (MATHEMATICS)

Date: 9th August, 2016.
Time: 8.30am – 10.30am

## KMA 100 - FOUNDATION MATHEMATICS

**INSTRUCTIONS TO CANDIDATES**

**ANSWER QUESTION ONE (COMPULSORY) AND ANY OTHER TWO QUESTIONS**

**QUESTION ONE (30 MARKS)**

a) Rationalize the denominator of $\dfrac{\sqrt{6}+\sqrt{3}}{\sqrt{6}-\sqrt{3}}$

(5 Marks)

b) Show that $\log_c a - \log_c b = \log_c\left(\dfrac{a}{b}\right)$

(5 Marks)

c) Factorize $2x^3 + x^2 - 8x - 4$

(5 Marks)

d) Simplify; $(1-i)^4$

(5 Marks)

e) Find the number of ways in which five boys and five girls can be seated in a row if boys and girls are to have alternate seats.

(6 Marks)

f) Solve the equation $2\sin^2\theta - \sin\theta - 1 = 0; \quad -180^o \le \theta \le 180^o$

(4 Marks)

**QUESTION TWO (20 MARKS)**

a) Simplify $\dfrac{x^{-2/3}\times y^{-1/3}}{\left(x^4y^2\right)^{-1/6}}$ (4 Marks)

b) Solve the equation $9^{x^2} = 3^{2x+6}$

(6 Marks)

c) Express $x$ in terms of $p, q,$ and $r$ if ;

$$\log x = 3\log p + \frac{1}{2}\log q - \log r + 3\log 10 \text{ (base 10)}$$ (4 Marks)

d) If the roots of the equation $x^2 - 5x - 7 = 0$ are $\alpha, \beta$, find the equation whose roots are $\alpha^2, \beta^2$

(6 Marks)

**QUESTION THREE (20 MARKS)**

a) The expression $ax^2+bx+c=0$ is divisible by $x-1$, has a remainder 2 when divided by $x+1$, and has remainder 8 when divided by $x-2$. Find the values of $a,b,c$.

(6 Marks)

b) By completing the square, solve the equation $2x^2-3x-10=0$

(4 Marks)

c) Express the following complex number in a form having a real denominator;

$$\frac{1}{2+3i}+\frac{1}{2-3i}$$

(4 Marks)

d) Simplify; $\dfrac{16!}{9!7!}+\dfrac{2\times16!}{10!6!}+\dfrac{16!}{11!5!}$

(6 Marks)

**QUESTION FOUR (20 MARKS)**

a) How many odd numbers greater than 60,000, can be made from the digits 5,6,7,8,9,0, if no number contains any digit more than once?

(4 Marks)

b) The second, fourth, and eighth terms of an Arithmetic Progression are in geometic progression, and the sum of the third and fifth terms is 20. Find the first four terms of the progression.

(6 Marks)

c) Prove by induction that; $1^2+3^2+5^2+...+(2n-1)^2=\dfrac{1}{3}n\left(4n^2-1\right)$

(6 Marks)

d) Write down the sum of the first $n$ terms of the series; 0.54+0.0054+0.000054+…. and deduce the sum to infinity.

(4 Marks)

**QUESTION FIVE (20 MARKS)**

a) Use binomial theorem to find the value of $\sqrt[3]{1.03}$ correct to four decimals.

(6 Marks)

b) Eliminate $\theta$ from the equations;

$$x=1-\sin\theta,\quad y=1+\cos\theta$$

(4 Marks)

c) Solve $3\cos2\theta-\sin\theta+2=0$ for $0^o\le\theta\le360^o$

(6 Marks)

d) Find the value of $\sin2\theta$ when $\cos\theta=\frac{12}{13}$

(4 Marks)