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**KIRIRI WOMENS' UNIVERSITY OF SCIENCE AND TECHNOLOGY**  
UNIVERSITY EXAMINATION, 2020/2021 ACADEMIC YEAR  
FIRST YEAR, FIRST SEMESTER EXAMINATION  
FOR THE DEGREE OF BACHELOR OF  
BUSINESS INFORMATION TECHNOLOGY

Date: 11<sup>th</sup> December, 2020  
Time: 11.30am – 1.30pm

**KMA 2103 - BASIC MATHEMATICS**

**INSTRUCTIONS TO CANDIDATES**

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

**QUESTION ONE (30 MARKS)**

- a) Define the following terms as used in foundation mathematics
- i) Surd (2 Marks)
  - ii) Rational numbers (2 Marks)
  - iii) Logarithm (2 Marks)
- b) Express  $3\sqrt[3]{\frac{81}{625}}$  in the form  $p\sqrt[3]{q}$  for rational numbers  $p$  where  $q$  contains no factors which are exact cubes of rational numbers. (2 Marks)
- c) Find  $y$  in terms of  $x$  if  $\log\left(\frac{x^2}{y}\right) = 5 - 2\log x$  (3 Marks)
- d) Expand  $(5 - 3x)^7$  up to the term containing  $x^2$ . (3 Marks)
- e) Solve the following quadratic equation by the method of completing the square  
 $2x^2 + 8x - 25 = 0$  (4 Marks)
- f) Show that  $2\sin B \cos A = \sin(A + B) - \sin(A - B)$  (3 Marks)
- g) Simplify  $\frac{(1+x)^{\frac{1}{3}} - \frac{1}{3}x(1+x)^{-\frac{2}{3}}}{(1+x)^{\frac{2}{3}}}$  (5 Marks)
- h) Solve for  $x$  if  $\log_3 x + \log_9 x^2 = 6$  (4 Marks)

**QUESTION TWO (20 MARKS)**

- a) Obtain the first four terms of the expansion  $\left(1 + \frac{1}{6}x\right)^{10}$  in ascending powers of  $x$ . Hence, find the value of  $(1.005)^{10}$ , correct to four decimal places. (8 Marks)
- b) Given that  $\sqrt{35} = 5.9160798$  correct to seven decimal places, evaluate  $\frac{\sqrt{7} - \sqrt{5}}{\sqrt{7} + \sqrt{5}}$  correct to six decimal places without use of tables or calculator. (6 Marks)
- c) Solve the equation  $\log_x 2 + 48 \log_{2x} 14 = 14$ , giving your answer to three significant figures. (6 Marks)

**QUESTION THREE (20 MARKS)**

- a) A polynomial  $f(x)$  has remainder 9 when divided by  $x - 3$  and remainder  $-5$  when divided by  $2x + 1$ . Find the remainder when divided by  $(x - 3)(2x + 1)$ . (8 Marks)
- b) Show that  $\tan(A + B) = \frac{\tan A + \tan B}{1 - \tan A \tan B}$  (8 Marks)
- c) Simplify  $\frac{\log 125}{\log 25}$  (4 Marks)

**QUESTION FOUR (20 MARKS)**

- a) If  $0 < x < \pi$  and  $\tan(X - A) = 3$ , where  $\tan A = 2$ , show that  $x = \frac{3}{4}\pi$  without using tables. (8 Marks)
- b) Calculate the remaining side and angles of triangle ABC in which  $c = 12$  cm,  $a = 8$  cm, and angle  $A = 30^\circ$ . (6 Marks)
- c) How many even numbers greater than 60 000 can be formed using the digits 0, 3, 4, 5, 6, and 7  
i) Without repeating digits  
ii) If repeating digits is allowed? (6 Marks)

**QUESTION FIVE (20 MARKS)**

- a) Draw the graph of  $y = 2x^2 - 12x + 19$  for  $1 \leq x \leq 5$ . By adding suitable lines to your graph  
i) Solve the equation  $x^2 - 6x + 6 = 0$  (5 Marks)  
ii) Solve the equation  $4x^2 - 25x + 28 = 0$  (5 Marks)
- b) Solve  $ax^2 + bx + c = 0$  by completing the square method where  $a$ ,  $b$  and  $c$  are real numbers and  $a \neq 0$ . (10 Marks)