MAKERERE UNIVERSITY JINJA CAMPUS

UBTEB Business Certificate Programs

PROGRAM: NATIONAL CERTIFICATE IN INFORMATION AND
COMMUNICATION TECHNOLOGY

SEMESTER ONE 2019/2020 INTAKE

MODULE NAME: BASIC MATHEMATICS

MODULE CODE: NCIT113

Mock Examination

DATE: Saturday, November 23, 2019

TIME: 09:00 hours – 12:00 hours

INSTRUCTIONS TO CANDIDATES:

This paper consists of **eight** *questions. All questions carry* **equal** *marks.*

Attempt any **five** *questions of your choice. Any additional question(s) answered* **will not** *be marked.*

All working must be shown **neatly and clearly** *in the answer booklet provided. Therefore no extra answer sheet will be given for* **rough work**.

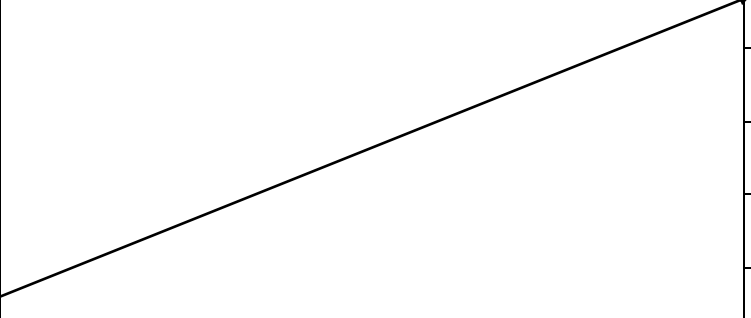*Start answering each question on a* **fresh page**.

Silent, non-programmable calculators may be used. Mobile Phones are **prohibited**.

Graph paper is provided.

Turn Over

. QUESTION 1: REAL & RATIONAL NUMBERS, INDICES, STANDARD FORM AND NOTATION

(a) (i) Match the numbers on the left with their corresponding category. One has been worked out for you as indicated by the arrow. (*4 marks*)

Numbers		Types of numbers
$\sqrt{2}$		**Rational**
-17		**Complex**
π		**Integer**
$i = \sqrt{-1}$		**Irrational**
$\frac{3}{8}$		**Natural**

(ii) Which one of the numbers in (i) above is not a real number? (*1 mark*)

(b) Simplify $\dfrac{1\frac{2}{5} + \frac{7}{8} \div \frac{5}{16}}{1 + \left(1\frac{1}{5} \times \frac{5}{8}\right)}$ (4 *marks*)

(c) Express 1. 341666… as a rational fraction. (*3 marks*)

(c) Without using a calculator evaluate

$16^{\frac{1}{2}} \quad x \quad 64^{-1/3} \quad \div \quad \left(\dfrac{8}{125}\right)^{\frac{2}{3}}$ (*4 marks*)

(d) Work out $4.22 \times 10^{-1} + 1.1 \times 10^{2}$ giving your answer in engineering notation (*4 marks*)

QUESTION 2: NUMBERING SYSTEMS

(a) Convert the following numbers to new numbering systems as indicated:

    i.   101.0101 binary to a decimal (*4 marks*)

    ii.   5613.90625 decimal to a binary number via octal (*4 marks*)

    iii.   7A hexadecimal to decimal (*3 marks*)

    iv.   12755octal to hexadecimal via binary (*3 marks*)

(b) Subtract in hexadecimal base: 73895 - 3D0A (*2 marks*)

(c) If $204_n = 66_{eight,}$ find base n. (*4 marks*)

QUESTION 3: LINEAR AND QUADRATIC EQUATIONS

a) The relationship between the temperature on a Fahrenheit scale and that on a Celsius scale is given by $F = \frac{9}{5}C + 32$. Express $113 \circ F$ in degrees Celsius. *(4 marks)*

b) Determine the number that needs to be added to $2x^2 + 5x$ to complete it to a perfect square, hence solve the quadratic equation $2x^2 + 5x - 3 = 0$ by completing the square. *(4 marks)*

c) Draw the graph of $y = 6 - x - 2x^2$ and $y - x = 0$ for $-3 \leq x \leq 3$ *(9 marks)*

d) Use your graph in (c) above to find

   i) the maximum point of the curve *(1 mark)*
   ii) the roots of the quadratic equation $0 = 6 - 2x - 2x^2$ *(2 marks)*

QUESTION 4: VARIATIONS AND INEQUALITIES

(a) Given that y is inversely proportional to the square of x and that $y = 1.25$ when $x = 2$, find the value of y when $x = 0.25$. *(4 marks)*

(b) The total cost (T) of operating a school is partly constant and partly directly proportional to the number of students (n). When the number of students is 10, the total cost is Shs 500,000 and when the number of students is 8, the total cost is Sh 450,000.

    i.   Write down an equation connecting T and n. *(4 marks)*

    ii.   Find the total cost of operating a school with 20 students. *(2 marks)*

    iii.   What will be the total population of a school whose total expenditure is 15 million? *(2 marks)*

(b). Solve $\frac{5-x}{7} - \frac{5}{168} \leq \frac{x+1}{3} - \frac{x}{8}$ *(4 marks)*

(c) Given that $M = \{x: x > -2\}$ and $N = \{x: 5 < 2x + 1 < 11\}$, using a number line find $M \cap N$.
. *(4 marks)*

QUESTION 5: SETS

(a) A and B are two sets such that $n(A^1) = 5$, $n(B^1) = 6$, $n(A \cap B) = 2$ and $n(\Sigma) = 10$.
Find $n(AnB)^1$. *(4 marks)*

(b) Given the set $p = \{1,2,4,6\}$ $Q = \{2,4,8\}$
How many subsets has a set P U Q got? *(4 marks)*

(c) In a class of 40 students, 17 play Tennis, 2 play Hockey and Tennis only. 3 play all the three games. Those who play Hockey only are one more than those who play Tennis only and three more than those who play football only. Those who play neither are two less than those who play football only. Given that the total number of students who play only one game is 20.

(i) Represent the above information in a Venn diagram and solve it.(*8 marks*)

(ii) Find the number of students who play only one game. (*2 marks*)

(iii) What is the probability that a student picked at random plays at least two games? (*2 marks*)

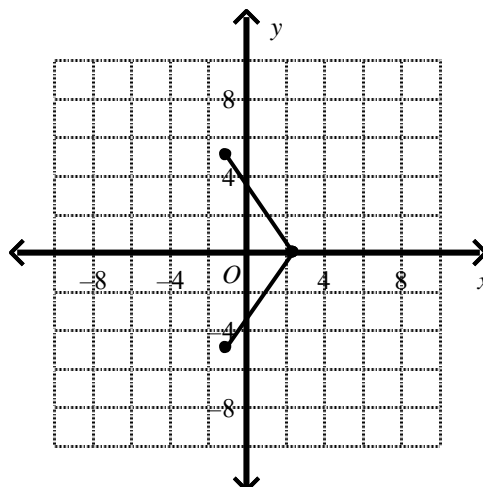## QUESTION 6. DOMAINS AND RANGES OF FUNCTIONS

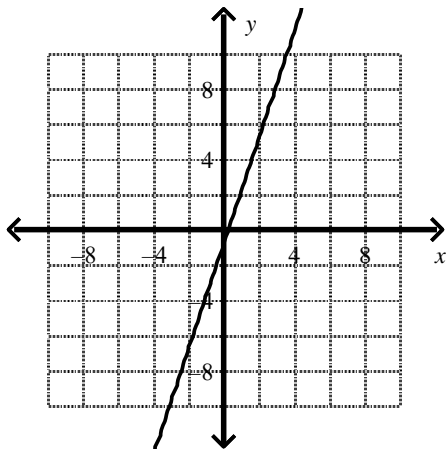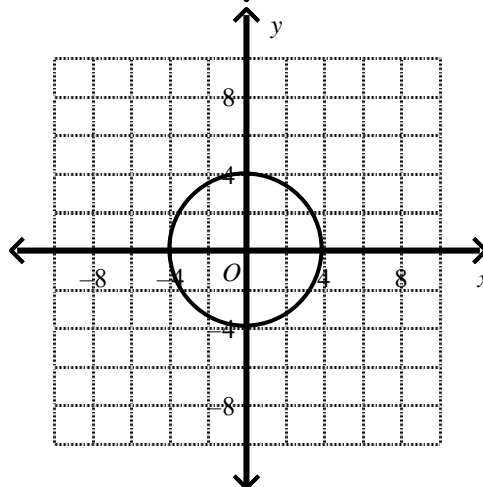(a) Use the vertical-line test to determine whether each graph represents a function or not.

i.
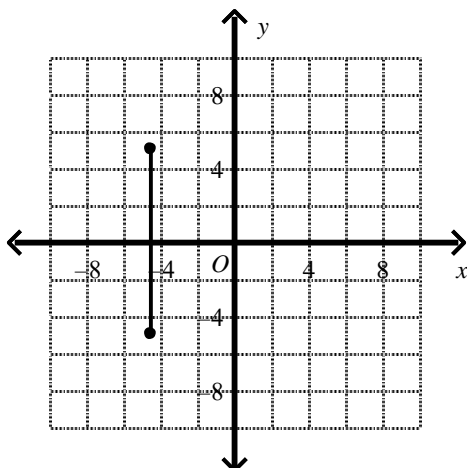
ii.

iii.

iv.

(*4 marks*)

(c) State the domain and range for each of the relations represented in the graphs in (a) above. (*4 marks*)

(c). The function f is defined by $f(x) = \dfrac{27}{x+a^2}$

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Given that $f(2) = 1$
Find
(i). the value of a.   (*4 marks*)
(ii). the value of $f(-4)$.   (*2 marks*)

(b). If $g(x) = 7x + 15$ and $h(x) = 2x^2$. Find x such that $g(x) = h(x)$ (*4 marks*)

(c). It is given that $f(x) = \dfrac{x + 10}{x - 2}$

Find the value of **x** for which the function is undefined.   (*2 marks*)

QUESTION 7: EQUATIONS OF A LINE AND GRAPHS

(a) Find the equation of the line passing through $(5, 2)$ and has Intercept $^-0.5$ (*4 marks*)

(b) Find the equation of the line passing through the points P $(2,0)$ and Q$(-6, 6)$. (*4 marks*)

(c) The line that represents the right boundary of a street is shown on the grid below.

   i. What is the equation of the left boundary, which is parallel to the right boundary, and passes through point $L(200, 100)$? (*5 marks*)

   ii. Graph the left boundary.   (*7 marks*)

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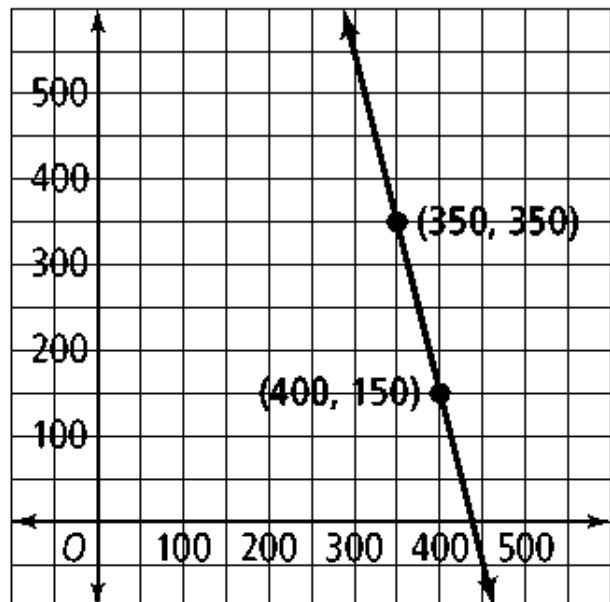
QUESTION 8: LOGARITHMS, EXPONENTIAL EQUATIONS, GROWTH AND DECAY.

(a) Without using tables or calculator, evaluate:

$$\frac{1}{2}\log_4 100 - 2\log_4 5 + \log_4 40$$

(4 marks)

(b) Determine the value of K in the expression.

$$\frac{1}{2}\log_3 K + \log_3 8 - \log_3 2 = 0$$

(4 marks)

(c) Given that $\text{Log}_{10} x = 0.4771$ and $\text{Log}_{10} y = 0.3010$,

Find the value of $x^3 y^2$, to the nearest number.

(4 marks)

(d) Which of the exponential equations below show **growth** and which show **decay**?

(i) $y = 100(1.7)^x$ (ii) $y = 8(0.4)^x$

(2 marks)

(e) There are 5,000 fish in the pond and the population is increasing by 2.1% each year.

i) Write an equation to determine the fish population after x years. *(4 marks)*

ii) How many fish will there be in 15 years? *(2 marks)*

END