THE MOMBASA POLYTECHNIC UNIVERSITY COLLEGE

(A Constituent College of JKUAT)
Faculty of Engineering and Technology

DEPARTMENT OF BUILDING AND CIVIL ENGINEERING

CERTIFICATE IN BUILDING & CIVIL ENGINEERING (CBC)

EBC 1102: CERTIFICATE ALGEBRA I

END OF SEMESTER EXAMINATION

SERIES: APRIL 2012

TIME: 2 HOURS

SECTION A (Compulsory)

Question 1 (30 marks)

a) Define the following terms   (2 marks)
   (i)   Equation
   (ii)   Transportation

b) Transpose the following formular to make r the subject of the formular   (4 marks)

$$d = \sqrt[2]{n(2r-n)}$$

c) Derive the Quadratic formula and hence solve the following equation

$$6x^2 - 8x - 9 = 0$$

                                      (6 marks)

d) Solve the unknowns in the following set of equation

$$5x - 3y - 2z = 31$$
$$2x + 6y + 3z = 4$$
$$4x + 2y - z = 30$$

                                      (6 marks)

e) Solve for x
   $$\log_3 16 + 2\log x = \log_3 64$$

                                      (3 marks)

$$x^2 - 6x - 4 = 0$$

f) Solve the following by completing the square   (6 marks)

g) Linearise the following equation   (3 marks)
   $$y = ae^{bx}$$

                                      (3 marks)

SECTION B (Answer any TWO questions)

Question 2 (20 marks)

a) Solve the following equation
   $$4x - 6y - 3 = 7x + 2y - 4 = 3y - 2x + 24$$

                                      (4 marks)

b) Solve the following

$$2\log_{10} x = 4$$

(4 marks)

c) Simplify the following equations (6 marks)
$$E = \left(5x^2 y^{-3/2} z^{1/4}\right)^2 \times \left(4x^4 y^z z\right)^{-1/2}$$

(6 marks)

d) Show that
$$\log_2 x + \log_3 x + \log_4 x = 7.079 \log_{10} x$$

(6 marks)

Question 3 (20 marks)

a) Solve for x and y using substitution method
$$3x + 2y = 6$$
$$4x - 3y = 10$$

(4 marks)

$$12^{2x} = 35.4$$

b) Solve the equation (4 marks)

$$\log_{10} 396 = 2.5977, \qquad \log_5 396$$

c) If   find (3 marks)

d) Determine whether or not the following set of equations an each be expressed as a product of linear factors (4 marks)

(i)
$$4x^2 + 3x - 4$$

(ii)
$$6x^2 + 7x + 2$$

(iii)
$$3x^2 + x - 4$$

(iv)
$$7x^2 - 3x - 5$$

e) The hypotenuse of a might angled triangle is 13cm. Find the length of the other two sides if their difference is 7cm (5 marks)

Question 4 (20 marks)

a) The sum of twice a number and its square is 48. Find the numbers. (3 marks)
b) State and give an example of each of the three laws of arithmetic (6 marks)
c) Simplify the following

$$F = \sqrt[3]{a^6 b^3} \div \sqrt{\tfrac{1}{9} a^4 b^6} \times \left(4\sqrt{a^6 b^2}\right)^{-1/2}$$

(5 marks)

d) Solve the following equation

$$7\left(14.3^{x+5}\right)\times 6.4^{2x} = 294$$

(5 marks)

e) State any **TWO** laws of logarithms (1 mark)

Question 5 (20 marks)

a) Given the equation below, find the value of x

$$\frac{4}{x-3}+\frac{2}{x}-\frac{6}{x-5}=0$$

(6 marks)

b) Find the numbers whose logarithms are
   (i)   0.1568
   (ii) 2.0088 (1 mark)
c) Define the following terms as used in logarithms (2 marks)
   (i)   Characteristic
   (ii) Mantissa

d) Make R the subject of the following formula

$$V = \frac{\pi h\left(3R^2 + h^2\right)}{6}$$

(5 marks)

e) Apply the laws of indices to simplify the following.
$$\frac{6x^{-4}\times 2x^3}{8x^{-3}}$$

(3 marks)
f) Name any **THREE** areas in real life where mathematics can be used (3 marks)