END OF FIRST SEMESTER EXAMINATIONS, APRIL, 2024

LEVEL 200
COURSE CODE: JBM 232
COURSE TITLE: FURTHER ALGEBRA

TIME ALLOWED: 2 HRS

STUDENT'S INDEX NUMBER:

VISIT: COLEMANPUBLICATION.COM FOR MORE

GENERAL INSTRUCTIONS:
- **This paper is made up of ONE SECTION.**
- *The Section is made up of five essay type questions.*
- *Answer any THREE questions in your answer booklet.*
- *Each question carries equal marks. You are expected to start each question on a new page.*
- **You are expected to hand over your answer booklet to the invigilator before you leave the examination hall.**
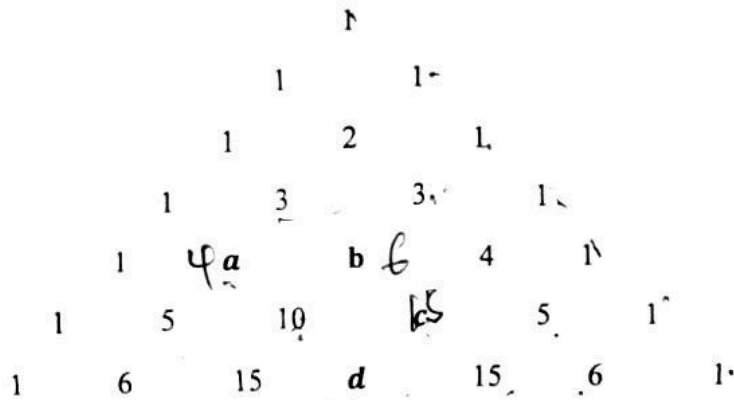
Instruction: *Answer any three (3) questions in the answer booklet provided.*

Question 1

a) The operation Δ is defined over the set of real numbers by $a\Delta b = a + b + 2ab$. Determine whether or not the operation is associative. (5marks)

b) Solve the equation $\log 9x - \log(x - 4) = 1$. (4marks)

c) Find the first four terms, in ascending powers of x, in the binomial expansion of $(1 - 2x)^{10}$. (3marks)

d) Use the answer of part (c) with a suitable value of x to find an approximate value for $(0.98)^{10}$, giving the answer correct to three decimal places. (5marks)

Question 2

a) Determine the values of a, b, c, and d in the pattern below. (4marks)

```
                          1        1-
                    1        2        1.
              1        3        3.        1.
         1      4a        b 6      4        1\
      1        5        10      k5      5.      1°
   1      6      15      d      15.      6      1.
```

b) Use Pascal's triangle to expand $(2x + y)^6$. (5marks)
From the expansion, state
i)   the fourth term;
ii)   the numerical coefficient of the third term;
iii) the exponent of x in the third term.

c) Given that $A = \begin{pmatrix} 3 & 1 \\ 5 & 2 \end{pmatrix}$ and $B = \begin{pmatrix} 2 & -1 \\ -5 & 3 \end{pmatrix}$, find the products AB and BA.
What conclusion can you draw about the matrices A and B? (8marks)

Question 3

a) The second, fourth and the eight terms of a linear sequence (AP) are the first three terms of an exponential sequence (GP). If the fifth term of the AP is 10 and the common difference is 2.
   i.   Write down the first three terms of the GP (4marks)
   ii. Find the twelfth term of the GP. (3marks)
b) Solve the quadratic function $2x^2 - 4x + 3 = 0$ by the method of completing the square. (8marks)

c) Find the truth set of the equation $8^{x-2} = 2^{x-8}$, where x is a real number. (5marks)

VISIT: COLEMANPUBLICATION.COM FOR MORE

a) Show that $\log_4 x = \frac{1}{2}\log_2 x$ and hence solve $\log_4 x + \frac{1}{2} = \log_2 x$. (5marks)

b) 1000 tickets were sold. Adult tickets cost GHC8.50, children's cost GHC4.50, and a total of GHC7300.00 was collected. How many tickets of each kind were sold? (10marks)

c) Given $3^{x-1} = m$, find 3^{x+1}. (5marks)

Question 5

a) If α and β are the roots of the quadratic equation $2x^2 + 7x + 6 = 0$, find

   I.   the values of (8marks)

      i. $\alpha + \beta$

      ii. $\alpha\beta$

      iii. $\alpha^2 + \beta^2$ (4marks)

   II.   the equation whose roots are α^2 and β^2.

b) Find the factors and zeros of $f(x) = x^3 - 2x^2 - 5x + 6$. (8marks)

$$2^{3(x-2)} \geq 2^{x-8}$$

$$3(x-2) = x-8$$