**UNIVERSITY OF EDUCATION, WINNEBA**

**INSTITUTE FOR TEACHER EDUCATION AND CONTINUING PROFESSIONAL DEVELOPMENT (ITECPD)**

4-YR B.Ed. IN JHS EDUCATION

**END OF FIRST SEMESTER EXAMINATIONS APRIL 2021**

| **Index Number of Candidate:** | | | | | | | | | | |
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**NAME OF COLLEGE:** **Signature:**

**JBM 232: LEARNING, TEACHING AND APPLYING FURTHER ALGEBRA**

TIME ALLOWED: **2HRS 30 MINS** LEVEL: **200**

**INSTRUCTIONS:**

1. Attempt **all** questions in sections A and **B** and **FOUR (4)** in section **C.**
2. Each question is followed by four options, **A – D.**
3. Write the letter corresponding to the correct answer in the options provided in the **answer booklet.**
4. The total marks for this paper is **40.**

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**SECTION A: ANSWER ALL THE QUESTIONS IN THIS SECTION**

1. A binary operation $\Delta$ is defined on the set of real numbers by $m\Delta n = m + n - \frac{1}{2}$ where $m, n \in R$. Find, under $\Delta$ the identity element.
   A. $\frac{1}{3}$
   B. $1\frac{1}{2}$
   C. $\frac{1}{2}$
   D. $\frac{2}{3}$
2. If $2, m, 50$ are consecutive terms of an exponential sequence, what is the value of $m$?
   A. 25
   B. 10
   C. 5
   D. 15
3. Find $x$ such that $x - 2, x, x + 3$ are consecutive terms in geometric progression
   A. 6
   B. 5
   C. 4
   D. -6
4. The roots of the quadratic equation $3x^2 + 4x - 5 = 0$ are $\alpha$ and $\beta$. Find $\frac{1}{\alpha} + \frac{1}{\beta}$.
   A. 4
   B. $\frac{5}{4}$
   C. $\frac{4}{5}$

D. $-\frac{5}{3}$

5. Given that $\log_{10} 3 = 0.4771$, calculate the values of $\log_{10} 81$
   A. 0.6990
   B. 1.9084
   C. 19.084
   D. −1.0984

6. Solve the logarithmic equation, $\log_2(2x + 1) = 3$
   A. 7
   B. $\frac{2}{7}$
   C. $\frac{7}{2}$
   D. $\frac{5}{2}$

7. If the determinant of the matrix $\begin{bmatrix} 5 & 3 \\ 4 & x \end{bmatrix}$ is −2, find the value of $x$
   A. 3
   B. 0
   C. −1
   D. 2

8. Given that $\begin{bmatrix} 1 & 0 \\ 2 & k \end{bmatrix}\begin{bmatrix} 3 & 2 \\ 0 & 1 \end{bmatrix} = \begin{bmatrix} 3 & 2 \\ 6 & 3 \end{bmatrix}$ find $k$.
   A. 1
   B. 0
   C. −1
   D. 3

9. The polynomial $f(x) = 2x^3 - 4x^2 + x - 7$ is divided by $x - 1$, find the remainder.
   A. −14
   B. 14
   C. 0
   D. −8

10. Simplify $20 \times 8^{2n} - 5 \times 4^{3n+1}$
    A. $2^{n+1}$
    B. 2
    C. 0
    D. 1

11. Find the value of $x$ that makes the equation $x^{-2} = 9$
    A. $x = -2$
    B. $x = \frac{1}{3}$
    C. $x = 3$
    D. $x = 2$

12. Find the log of 32 to the base 4.
    A. $\frac{5}{2}$

B. $\frac{2}{5}\frac{5}{4}\frac{4}{5}$

C.

D.

13. 9 pens and 5 pencils cost GHS 3.20, and 7 pens and 8 pencils cost GHS 2.90. Find the unit price for each pen and pencil.
    A. A pen costs GHS 0.30 and pencil cost GHS 1.00
    B. A pen cost GHS 0.30 and pencil cost GHS 0.10
    C. A pen cost GHS 6.10 and pencil cost GHS 1.00
    D. A pen cost GHS 6.10 and pencil cost GHS 0.10

14. If $2\log 3 = a\log 9$, find the value of $a$.
    A. 1
    B. 2
    C. 3
    D. 4

15. Given that $4x + 3y = 14$ *and* $5x + 7y = 11$, what is the value of $x - y$
    A. 4
    B. 1
    C. $-1$
    D. $-4$

16. Find the discriminant of the quadratic equation $2x^2 + 5x + 15 = 0$
    A. $-185$
    B. $-95$
    C. 95
    D. 185

17. If $a > 0$ then $\log_a a^k$ is equal to
    A. $3k$
    B. $2k$
    C. $k$
    D. $-k$

18. Which of the following matrices has no inverse
    A. $\begin{bmatrix} 5 & 2 \\ 1 & 2 \end{bmatrix}$
    B. $\begin{bmatrix} 3 & 4 \\ 2 & 3 \end{bmatrix}$
    C. $\begin{bmatrix} 1 & 1 \\ 2 & 3 \end{bmatrix}$
    D. $\begin{bmatrix} 3 & -3 \\ -2 & 2 \end{bmatrix}$

19. Solve the equation $5^{x^2} = 25^{6-2x}$
    A. $\{x: x = -6, 2\}$
    B. $\{x: x = 6, 2\}$
    C. $\{x: x = -6, -2\}$

D. $\{x: x = 6, -2\}$

20. For any quadratic equation when $b^2 - 4ac > 0$, we have
    A. Complex roots
    B. Real Distinct Roots
    C. Equal roots
    D. No solution

**SECTION B: ANSWER ALL THE QUESTIONS IN THIS SECTION (10 MARKS)**

1. The binary operation $*$ is defined as $a * b = \frac{a+b}{ab}$ evaluate $-3 * 4$.
2. If $a\Delta b = b\Delta a = e$, where e is the identity element, then b is said to be termed as.....
3. Find the series of the AP; $4, 6\frac{1}{2}, 9, 11\frac{1}{2}$
4. Calculate the 5th term of the exponential sequence with first term as $\frac{1}{2}$ and common ratio $-\frac{1}{2}$
5. Find the quadratic equation whose roots are 1 and 3
6. Show that the binary operation $x \odot y = y \odot x$ is **not** commutative.
7. A linear sequence A.P has a 7th term of 3 and a 12th term of $-7$. Find the common difference.
8. What is the inverse of a real number y under multiplication.....$\frac{1}{y}$.....
9. Each of a succession terms of a geometric progression (GP) is obtained by multiplying the preceding term by a fixed quantity called.....
10. A square matrix in which every element if the main diagonal is zero is called.....

**SECTION C: ANSWER ANY FOUR (4) QUESTIONS OF YOUR CHOICE**

1. a) Express $(2x + 1)^5$ in the descending powers of x.
   b) Use the expression in (a) to evaluate $(1.25)^5$ leave your answer in three significant figures.
2. If $A = \begin{bmatrix} -2 & 4 \\ 5 & 3 \end{bmatrix}$ and $B = \begin{bmatrix} 3 & -2 \\ 1 & -3 \end{bmatrix}$, find the values of p and q such that $AB = \begin{bmatrix} p & 1 \\ -3 & -4 \end{bmatrix} + 3\begin{bmatrix} -1 & -3 \\ 7 & q \end{bmatrix}$
3. Find the remainder when $-2x^4 + 4x^3 - x^2 + 5x + 6$ is divided by $x + 4$
4. The roots of equation $x^2 - px + 8 = 0$ are $\alpha$ *and* $\beta$. If the roots differ by 2. Calculate the possible values of p.
5. Use determinant to solve the simultaneous equations: $3x + 2y = 3$ and $4x + 5y = 11$
6. Prisoners digging a tunnel managed to dig $4m$ on the first day. Each day thereafter, they dig only $\frac{5}{8}$th of the distance of the previous day. How long will the tunnel be by the end of the 8th day? Correct to 2dp.

$(1+x)^n = 2^5\left(x + \frac{1}{5}\right)$