TEVETA
Technical Education, Vocational and Entrepreneurship Training Authority

LEVEL 5 CERTIFICATE IN AUTOMOTIVE/HEAVY EQUIPMENT/AUTOMOTIVE ELECTRICAL & ELECTRONICS ENGINEERING

LEVEL 5 YEAR I EXAMINATIONS

FINAL INTEGRATED SUMMATIVE EXAMINATIONS

SITTING: APRIL/MAY 2026

SUBJECT: ENGINEERING MATHEMATICS I

TIME: THREE (3) HOURS TOTAL MARKS: 100

PASS MARK: 50

INSTRUCTIONS TO CANDIDATE

1. Write your examination number and national registration card numbers on the answer booklet provided. Ensure to append your signature in the space provided on the answer booklet
2. Write your answer SCRIPT SERIAL NUMBER on the examination register Provided and the entry slip.
3. There are Eight (8) questions in this paper.
4. Question ONE (1) is COMPULSORY, Attempt any other FOUR (4) questions.
5. Each question carries 20 marks.
6. Cell phones and programmable calculators are not allowed in the examination room.
7. No candidate is allowed to leave the examination room one (1) hour after the start of the examination and thirty (30) minutes before the end of the examination.

DO NOT TURN THIS PAPER UNTIL YOU ARE TOLD TO DO SO

QUESTION 1 - COMPULSORY

(a) If the 5^{th} term of an arithmetic progression is -4 and the 10^{th} term is -16, determine

(i) The first term **[5 marks]**

(ii) The common difference **[5 marks]**

(b) The position vector of P and Q are $2i + j \; and \; -3i + 2j$ respectively. Determine $< POQ$ **[5 marks]**

(c) The position vectors of the points are given as; $\overrightarrow{OA} = \begin{pmatrix} -3 \\ 1 \\ 2 \end{pmatrix}, \overrightarrow{OB} = \begin{pmatrix} 0 \\ 1 \\ -3 \end{pmatrix}, \overrightarrow{OC} = \begin{pmatrix} 2 \\ -1 \\ 4 \end{pmatrix}$

Determine the unit vector in the direction of $\overrightarrow{AB}$ **[5 marks]**

[Total:20 marks]

QUESTION 2

(a) Simplify $\left(\frac{2}{3} \times 1\frac{1}{4}\right) \div \left(\frac{2}{3} + \frac{1}{4}\right) + 1\frac{3}{4}$ **[4 marks]**

(b) If 12 technicians can finish the work in 50 hours, how many workers will be required to finish the same work in 40 hours (assuming constant work rate. **[4 marks]**

(c) Solve $7 + 4x - 2x^2 = 0$ by completing of the square method **[6 marks**

(d) Solve the equation $2\log_2(x + 15) - \log_2 x = 2$ **[6 marks]**

[Total:20 marks]

QUESTION 3

(a) If $x + 1, x + 3 \; and \; x + 8$ are the first three terms of a geometric series, determine

(i) The value of x **[4 marks]**

(ii) The common ratio r **[4 marks]**

(iii) The sum of the first 3 terms **[5 marks]**

(b) If α and β are the roots of the quadratic equation $2x^2 - 4x + 5 = 0$ Determine the value of $\frac{1}{2\alpha+\beta} + \frac{1}{\alpha+2\beta}$ **[7 marks]**

[Total:20 marks]

QUESTION 4

(a) The solid cone has diameter 6cm and perpendicular height 4cm

Determine

(i) The volume of the cone **[4 marks]**

(ii) The curved surface area **[3 marks]**

(iii) The total surface area **[4 marks]**

(b) Sketch the graph of the following

(i) $y = -2 + 3\sin(\theta + 45°)$ **[4 marks]**

(ii) $y = 1 + \cos(x - \pi)$ **[5 marks]**

[Total:20 marks]

QUESTION 5

(a) Determine the equation of the line passing through $(-2, 3)$ and

(i) Parallel to $2y + 5x + 7 = 0$ **[5 marks]**

(ii) Perpendicular to $2y + 5x + 7 = 0$ **[5 marks]**

(b) A piece of wire $56cm$ long is bent to form the perimeter of the rectangle whose area is $171cm^2$. What are the dimensions of the rectangle? **[10marks]**

[Total:20 marks]

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QUESTION 6

(a) Determine the first four terms in the binomial expansion of $(1-2x)^{10}$. **[6 marks]**

(b) Solve for x:

(i) $log\ 2^x = 7$ **[4 marks]**

(ii) $2^{2x+3} + 2^{x+3} = 1 + 2^x$ **[5 marks]**

(c) Determine the term independent of x in the expression of $(x+2)^4$ **[5 marks]**

[Total:20 marks]

QUESTION 7

(a) Prove the identity $\sqrt{\frac{1+cos\theta}{1-cos\theta}} = cosec\theta + cot\theta$ **[5 marks]**

(b) If $tan\theta = \frac{8}{15}$ with α in the first quadrant and $cos\beta = \frac{7}{25}$ with β in the fourth quadrant, determine $\sin(\alpha + \beta)$ **[8 marks]**

(c) Write 342604 to 2 significant figures **[2 marks]**

(d) Divide a line 14cm long into two parts such that the length of one part is $\frac{3}{4}$ of the other. **[5 marks]**

[Total:20 marks]

QUESTION 8

(a) Solve by completing of the square method; $3r^2 - 7r + 4 = 0$ **[6 marks]**

(b) Given the two vectors $a = 3i + j$ and $b = 3i - j$. Determine the following:

(i) $a.b$ **[4 marks]**

(ii) $a \times b$ **[6 marks]**

(iii) Unit vector of $a\ and\ b$ **[4 marks]**

[Total:20 marks]

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