



Prifysgol Cymru
Y Drindod Dewi Sant
University of Wales
Trinity Saint David

LOCATION: SWANSEA

LLEOLIAD: ABERTAWE

LEVEL 4

LEVEL 4

**EXAMINATION PERIOD
NOVEMBER 2021**

**MODULE CODE: ACMA4006 (PART-TIME)
ENGINEERING MATHEMATICS (TEST 1)**

TIME: 1 ½ HOURS

ANSWER ALL QUESTIONS

Equipment or materials required –

Calculators allowed

Formula booklet provided

Show all workings

Total marks: 86

IMPORTANT INSTRUCTIONS FOR ONLINE EXAMINATIONS:

- *You will need to submit a digital photograph or scan of each page of workings*
- *Please submit these to Moodle (underneath where you accessed the exam paper)*
- *Put the time, date, module code and your student number at the top of each page*
- *Number each page 'x of y'*
- *If you have any issues, email richard.sutton@uwtsd.ac.uk*

QUESTION ONE

a) Solve the following equations, using the appropriate method, for x :

(i) $\frac{(x+7)}{3} - \frac{(x-2)}{4} = \frac{2x+3}{5}$

(ii) $2 \ln(2x + 5) = \ln(3x + 1) + \ln(4x + 3)$

(iii) $5^{x+4} = 3 \times 4^x$

(13 marks)

QUESTION TWO

a) Solve the following quadratic equation by using the quadratic formula:

$$12x^2 = -4x + 15$$

(5 marks)

b) Solve the following quadratic equations **by using the factorisation method**:

(i) $x^2 + 5x + 6 = 0$

(ii) $x^2 - 10x + 24 = 0$

(iii) $x^2 - 100 = 0$

(iv) $2x^2 + 3x = 14$

(13 marks)

QUESTION THREE

a) Solve the following trigonometric equations for $0^\circ \leq x \leq 360^\circ$:

(i) $\cos x = 0.76$

(ii) $-6 \sin x = 5$

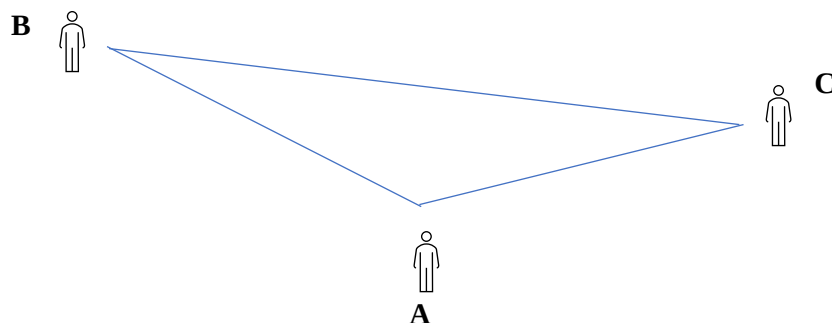
(iii) $\tan^2 x + 2 \tan x - 15 = 0$

(12 marks)

QUESTION FOUR

The following people are testing some distance measuring apparatus. If the angle at point A is 72° , the angle at point B is 35° and the distance between person A and C is 45 metres, calculate:

- (i) The angle at C
- (ii) The distance between person A and person B
- (iii) The distance between person B and person C



Triangle not drawn to scale.

(6 marks)

QUESTION FIVE

a) Find the first derivative of the following functions:

(i) $y = 7x^4 - 2x^2 + e^x - 1$

(ii) $y = (x^2 - 1)^2$

(iii) $y = \sqrt[3]{x} - \frac{5}{x^3}$

(iv) $y = 4 \sin 3x + \cos 6x - \tan \frac{x}{2}$

(v) $y = x^6 e^{4x}$

(vi) $y = \frac{\tan 4x}{x^4 - 2x + 5}$

(vii) $y = (2x^5 - \sin 7x + e^{2x})^7$

(viii) $y = \sin^{-1} \left(\frac{x}{2} \right)$

(25 marks)

b) Given the following set of simultaneous equations, find *all* solutions of x and y :

$$\begin{aligned} y &= x^2 + 9x - 2 \\ y &= 2x^2 + 13x - 7 \end{aligned}$$

(6 marks)

c) Find the four second order partial derivatives of the following:

$$z = x^4 - 2x^5y^3 + 3y^5$$

(6 marks)