



Prifysgol Cymru
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University of Wales
Trinity Saint David

LOCATION: SWANSEA

LLEOLIAD: ABERTAWE

LEVEL 4

LEVEL 4

**EXAMINATION PERIOD
JULY 2022**

**MODULE CODE: ACMA4006 (FULL-TIME AND PART-TIME)
ENGINEERING MATHEMATICS (TEST 2 RESIT)**

TIME: 1 ½ HOURS

ANSWER ALL QUESTIONS

Equipment or materials required –

Calculators allowed

Formula booklet provided

Show all workings

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 – MATRICES

a) Consider the following matrices:

$$A = \begin{pmatrix} 3 & 2 & 1 \\ 2 & 8 & 1 \\ 2 & 1 & 7 \end{pmatrix} \quad B = \begin{pmatrix} 1 & 2 & 1 \\ 1 & 7 & 3 \\ 0 & 1 & 6 \end{pmatrix} \quad C = \begin{pmatrix} 1 & 2 \\ 1 & 5 \\ 4 & 0 \end{pmatrix} \quad D = \begin{pmatrix} 1 & 3 \\ 10 & 2 \end{pmatrix}$$

Calculate the following, if mathematically possible:

(i) AB

(ii) AC

(iii) A+B

(iv) A+D

(v) BD

(vi) 4D

(14 marks)

b) Use Cramer's rule to solve the following simultaneous equations:

$$x + y + 2z = 6$$

$$3x + y + z = 6$$

$$2x + y + 2z = 7$$

(8 marks)

QUESTION TWO – COMPLEX NUMBERS

a) Given the following complex numbers, $z_1 = 1 + 6j$, $z_2 = 2 + 5j$ and $z_3 = 3 + 4j$, calculate the following, expressing your answers in cartesian form:

(i) $z_1 + z_2$ (ii) $z_1 - z_3$ (iii) $\frac{z_1}{z_2}$

(5 marks)

b) Solve the following quadratic equation, **expressing your answers in Polar Form**:

$$11x^2 + 2x + 19 = 0$$

(10 marks)

c) Use de Moivre's theorem to calculate the following, giving your answers in rectangular form:

(i) $(1 + 7j)^4$

(6 marks)

QUESTION THREE – INTEGRATION

a) Integrate the following:

(i) $\int x^4 - 3x^2 + 5x - 1 \, dx$

(ii) $\int (x - 8)(x + 3) \, dx$

(iii) $\int 2 \sin 3x - \frac{1}{x} \, dx$

(iv) $\int_0^3 (3x + 2)(2x + 1) \, dx$

(19 marks)

b) Use integration by parts to integrate the following:

(i) $\int 7x \sin 3x \, dx$

(6 marks)

TOTAL MARKS: 68