

LOCATION: SWANSEA

LLEOLIAD: ABERTAWE

LEVEL 4

LEVEL 4

EXAMINATION PERIOD
JANUARY 2021

MODULE CODE: ACMA4006 (FULL-TIME)
ENGINEERING MATHEMATICS (TEST 2)

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:

$$A = \begin{pmatrix} 1 & 0 & 2 \\ 2 & 8 & 7 \\ -7 & 2 & 0 \end{pmatrix} \quad B = \begin{pmatrix} 1 & 2 & 3 \\ -4 & 1 & 0 \\ 0 & 7 & 2 \end{pmatrix} \quad C = \begin{pmatrix} 7 & 1 \\ 3 & 8 \\ 2 & 7 \end{pmatrix} \quad D = \begin{pmatrix} 2 & 12 \\ 2 & 5 \end{pmatrix}$$

Calculate the following, if mathematically possible:

(i) AB

(ii) AC

(iii) A+B

(iv) A+D

(v) BD

(vi) 2D

(15 marks)

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

$$5x + y + 2z = 32$$

$$x - y + z = 10$$

$$2x + 5y + 2z = 13$$

(8 marks)

c) If a matrix is denoted by **A**, what is denoted by $|\mathbf{A}|$?

(1 mark)

Turn over for questions 2 and 3.

QUESTION TWO – COMPLEX NUMBERS

a) Given the following complex numbers, $z_1 = 1 + 7j$, $z_2 = 2 - 5j$ and $z_3 = -2 + 3j$, calculate the following, expressing your answers in cartesian form:

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

(6 marks)

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

$$11x^2 + 3x = -17$$

(10 marks)

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

(i) $(3 - 5j)^5$

(6 marks)

QUESTION THREE – INTEGRATION

a) Integrate the following:

(i) $\int 3x^3 - 5x^2 + 3x - 10 \, dx$

(ii) $\int (x + 5)(x + 3)(x - 2) \, dx$

(iii) $\int 5 \sin 3x + \frac{1}{x} \, dx$

(iv) $\int_2^5 (3x + 1)(6x + 2) \, dx$

(20 marks)

b) Use integration by parts to integrate the following:

(i) $\int 2x \sin 3x \, dx$

(6 marks)

TOTAL MARKS: 72

End of paper.