



## Examination Answer Books

12 Pages

### Instructions to Candidates

1. Please give the information requested in the boxes below.
2. Enter your name in the space provided to the right, fold over and seal down (using the label provided) to hide your name.
3. The answers must be legibly written. The Examiners can either ignore illegible script or have it typed and the expense of typing charged to the candidate.
4. Write your answers in ink.
5. Begin each answer on a fresh page. Do all rough work in the answer book and cross it through.
6. No part of this book is to be torn out; it must be handed in complete.
7. If more books than one are used, fasten them together using the tags available from the invigilator(s).
8. Every book must be handed in. In no circumstances may answer books, used or unused, be taken out of the examination venue.

Complete, fold and seal  
(see note 2 below)

SURNAME:

Silman

FORENAME(S):

Thomas David

|   |                                  |                 |
|---|----------------------------------|-----------------|
| 1 | Student Number                   |                 |
| 2 | Title of Examination Paper       |                 |
| 3 | Module Code                      | SGEE 4002       |
| 4 | Date and Time of Examination     | 14:30<br>7/3/22 |
| 5 | Examination Venue                |                 |
| 6 | Seat Number                      |                 |
| 7 | Number of Answer Books handed in |                 |

| List the numbers of the questions you have attempted | Office Use |
|------------------------------------------------------|------------|
| A1                                                   | } 18       |
| A2                                                   |            |
| A4                                                   |            |
| B1                                                   | 4          |
| <del>A3</del>                                        |            |
| B4                                                   | 4          |
|                                                      |            |
|                                                      |            |
|                                                      |            |
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|                                                      |            |
|                                                      |            |
|                                                      |            |
| Total                                                | 26.        |

1.  $15(3x+2) - 8(2-4x) = 125$

$$45x + 30 - 16 + 32x = 125$$

$$77x + 14 = 125$$

$$77x = 125 - 14 = 111$$

$$x = \frac{111}{77}$$

$$x = 1.44$$

5

A2.

(i)  $4A - 3B$ 

$$\begin{pmatrix} 3 & -1 \\ 5 & 1 \end{pmatrix} \times 4 = \begin{pmatrix} 12 & -4 \\ 20 & 4 \end{pmatrix} = 4A$$

$$\begin{pmatrix} 2 & -3 \\ 2 & 1 \end{pmatrix} \times 3 = \begin{pmatrix} 6 & -9 \\ 6 & 3 \end{pmatrix} = 3B$$

$$\begin{pmatrix} 12 & -4 \\ 20 & 4 \end{pmatrix} - \begin{pmatrix} 6 & -9 \\ 6 & 3 \end{pmatrix} = \begin{pmatrix} 6 & 5 \\ 14 & 1 \end{pmatrix} = 4A - 3B$$

(ii)  $BC$ 

$$\begin{pmatrix} 2 & -3 \\ 2 & 1 \end{pmatrix} \times \begin{pmatrix} 4 & -3 & 2 \\ 2 & 3 & 4 \end{pmatrix} = \begin{pmatrix} 2 & -15 & -8 \\ 6 & -3 & 8 \end{pmatrix}$$

~~$$\begin{aligned}
 P_{011} &= (2 \times 4) + (-3 \times 2) & D_1^1 &= (2 \times 4) + (-3 \times 2) = 2 \\
 P_{012} &= (2 \times -3) + (-3 \times 3) & D_1^2 &= (2 \times -3) + (-3 \times 3) = -15 \\
 P_{013} &= (2 \times 2) + (-3 \times 4) & D_1^3 &= (2 \times 2) + (-3 \times 4) = -8 \\
 P_{021} &= (2 \times 4) + (1 \times 2) & D_2^1 &= (2 \times 4) + (1 \times 2) = 6 \\
 P_{022} &= (2 \times -3) + (1 \times 3) & D_2^2 &= (2 \times -3) + (1 \times 3) = -3 \\
 P_{023} &= (2 \times 2) + (1 \times 4) & D_2^3 &= (2 \times 2) + (1 \times 4) = 8
 \end{aligned}$$~~

(iii)  $A^{-1}$ 

$$A = \begin{pmatrix} 3 & -1 \\ 5 & 1 \end{pmatrix} \quad \begin{pmatrix} 1 & 1 \\ -5 & 3 \end{pmatrix}$$

4. Convert to polar

$$Z_1 = 5 - j4$$

$$\sqrt{5^2 + 4^2} = 6.40 \quad \checkmark$$

$$\tan^{-1}(4/5) = 38.66^\circ = \theta_1$$

$$Z_1 = 6.40 \angle 38.66^\circ \quad \times$$

$$Z_2 = 3 + j5$$

$$\sqrt{3^2 + 5^2} = 5.83 = r_2 \quad \checkmark$$

$$\tan^{-1}(5/3) = 59.04^\circ = \theta_2 \quad \checkmark$$

$$Z_2 = 5.83 \angle 59.04^\circ \quad \checkmark$$

$$(i) Z_1 Z_2 = 6.40 \angle 38.66^\circ \times 5.83 \angle 59.04^\circ$$

$$= 6.4 \times 5.83 = 37.31$$

$$= \angle 38.66^\circ + \angle 59.04^\circ = 97.7^\circ$$

$$= 37.31 \angle 97.7^\circ \quad \times$$

$$(ii) \frac{Z_1}{Z_2} = \frac{6.40}{5.83} = 1.10 \quad \angle 38.66^\circ - \angle 59.04^\circ = \angle -20.38^\circ$$

$$= 1.1 \angle -20.38^\circ \quad \times$$

7

|    |
|----|
| 18 |
| 40 |

$$B1. \quad 7I_1 + 8(I_1 + I_2) = 12 \quad /$$

$$7I_1 + 8I_1 + 8I_2 = 12 \quad /$$

$$15I_1 + 8I_2 = 12 \quad /$$

$$14I_2 + 8(I_1 + I_2) = 8 \quad /$$

$$14I_2 + 8I_1 + 8I_2 = 8 \quad /$$

$$8I_1 + 22I_2 = 8 \quad /$$

4  
20

3. ~~Q. 3. Differentiate~~

Differentiate  $y = 5x^3 - \frac{3}{x^2} + 4\sqrt{x}$

$$= 15x^2 - x^{-2/3} + 4x^{1/2} \quad \times$$

0

4

(i) Differentiate  $y = \frac{2e^{6x}}{\sin 3x}$  and  $y = 6\cos(3x-5)$

a)  $y = \frac{6(2e^{6x})}{\sin 3x}$  X

b)  $y = -18\sin(3x-5)$  ✓

4  
—  
20