



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

## 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: Osborne

FORENAME(S): Morgan Alexander

|   |                                  |                       |
|---|----------------------------------|-----------------------|
| 1 | Student Number                   |                       |
| 2 | Title of Examination Paper       | Phase test 1          |
| 3 | Module Code                      | PCEE 4000             |
| 4 | Date and Time of Examination     | 23/01/2019            |
| 5 | Examination Venue                | Pembrokeshire College |
| 6 | Seat Number                      |                       |
| 7 | Number of Answer Books handed in |                       |

| List the numbers of the questions you have attempted | Office Use |
|------------------------------------------------------|------------|
| 1                                                    | 1          |
| 2                                                    | 16         |
| 3                                                    | 10         |
| 4                                                    | 11         |
| 5                                                    | 16         |
| 6                                                    | 15         |
| 7                                                    | 0          |
| 8                                                    | 0          |
| 9                                                    | 0          |
|                                                      |            |
|                                                      |            |
|                                                      |            |
|                                                      |            |
|                                                      |            |
|                                                      |            |
| Office Use                                           | 69         |



2)

i)  $3(x-5) - 2(4-5x) - 3 = 0$

$$= 3x - 15 - 8 + 10x - 3 = 0 \quad \checkmark$$

$$= 13x - 26 = 0$$

$$13x = 26$$

$$x = \frac{26}{13} \quad \checkmark$$

$$x = 2 \quad \checkmark$$

(4)

ii)  $3x^2 + 11x - 4 = 0$

$$a = 3 \quad b = 11 \quad c = -4$$

$$\frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$x = \frac{-11 + \sqrt{11^2 - 4 \times 3 \times -4}}{2 \times 3} = 0.33 \quad \checkmark$$

$$x = \frac{-11 - \sqrt{11^2 - 4 \times 3 \times -4}}{2 \times 3} = -4 \quad \checkmark$$

$$\therefore x = 0.33 \text{ and } -4 \quad \checkmark$$

(6)

iii)  $1.5 \times 10^{2x-1} = 153 \quad \therefore 10^{2x-1} = \frac{153}{1.5} = 102 \quad \therefore 10^{2x-1} = 102 \quad \checkmark$

$$\therefore (2x-1) \log_{10} = \log_{10} 102 \quad \therefore 2x-1 = \log_{10} 102$$

$$\therefore 2x = \log_{10} 102 + 1 \quad \checkmark \quad x = \frac{\log_{10} 102 + 1}{2} = 1.5 \quad \checkmark$$

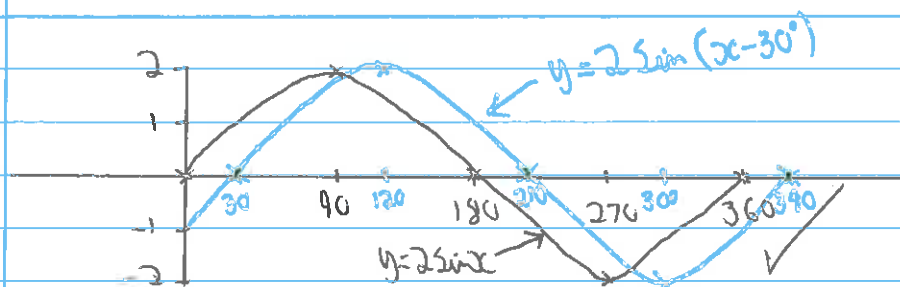
$$x = 1.5 \quad \text{correct to 2dp}$$

(6)

✓  
KDP

3)

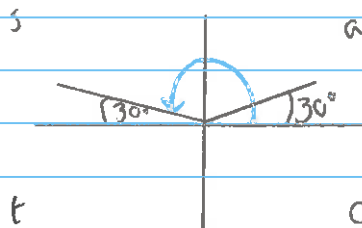
i)



(6)

ii)  $\sin 2x = 0.5$

$\therefore 2x = \sin^{-1} 0.5 = 30^\circ$  (1)



$2x = 30^\circ, 360^\circ - 30^\circ, 30^\circ + 360^\circ, 360^\circ - 30^\circ + 360^\circ$   
 $2x = 30^\circ \checkmark, 330^\circ \times, 390^\circ \checkmark, 690^\circ \times$   
 $x = 15^\circ \checkmark, 165^\circ, 195^\circ \checkmark, 345^\circ$

c  
 (1)  
 (1)  
 (1)

(4)

50P

$$4) \quad Z_1 = 3 + j2 \quad Z_2 = -1 - j5$$

$$i) \quad (3 + j2) - (-1 - j5) \\ = 4 + j7 \quad \checkmark$$

(3)

$$ii) \quad (3 + j2)(-1 - j5) \\ = -3 - j15 - j2 - j^2 10 \quad \checkmark \\ = -3 - j17 - (-1)10 \quad \checkmark \\ = -3 - j17 + 10 \quad \checkmark \\ = 7 - j17 \quad \checkmark$$

(4)

$$iii) \quad \frac{(3 + j2)}{(-1 - j5)} \times \frac{(-1 + j5)}{(-1 + j5)} = \frac{-3 + j15 - j2 + j^2 10}{1 - j8 + j5 - j^2 25} \quad \checkmark$$

$$= \frac{-3 + j13 + (-1)10}{1 - (-1)25} = \frac{-3 + j13 - 10}{1 + 25} \quad \checkmark$$

$$= \frac{-13 + j13}{26} = \frac{-13}{26} + \frac{j13}{26} \quad \checkmark$$

Simplify!

(4)

SDP

$$5) \quad A = \begin{pmatrix} 1 & 3 \\ -1 & -2 \end{pmatrix} \quad B = \begin{pmatrix} 0 & 1 \\ -3 & 2 \end{pmatrix}$$

$$i) \quad 3 \begin{pmatrix} 0 & 1 \\ -3 & 2 \end{pmatrix} - \begin{pmatrix} 1 & 3 \\ -1 & -2 \end{pmatrix} = \begin{pmatrix} 0 & 3 \\ -9 & 6 \end{pmatrix} - \begin{pmatrix} 1 & 3 \\ -1 & -2 \end{pmatrix} = \begin{pmatrix} -1 & 0 \\ -8 & 8 \end{pmatrix} \quad (3)$$

$$ii) \quad \begin{pmatrix} 1 & 3 \\ -1 & -2 \end{pmatrix} \begin{pmatrix} 0 \\ -3 \end{pmatrix} \begin{pmatrix} 1 \\ 2 \end{pmatrix} = \begin{bmatrix} 1 \times 0 + 3 \times -3 & 1 \times 1 + 3 \times 2 \\ -1 \times 0 + -2 \times -3 & -1 \times 1 + -2 \times 2 \end{bmatrix}$$

$$= \begin{pmatrix} -9 & 7 \\ 6 & -5 \end{pmatrix} \quad \checkmark \quad (4)$$

$$iii) \quad \begin{pmatrix} 0 & 1 \\ -3 & 2 \end{pmatrix} \begin{pmatrix} 1 \\ -1 \end{pmatrix} \begin{pmatrix} 3 \\ -2 \end{pmatrix} = \begin{bmatrix} 0 \times 1 + 1 \times -1 & 0 \times 3 + 1 \times -2 \\ -3 \times 1 + 2 \times -1 & -3 \times 3 + 2 \times -2 \end{bmatrix}$$

$$= \begin{pmatrix} -1 & -2 \\ -5 & -13 \end{pmatrix} \quad \checkmark \quad (4)$$

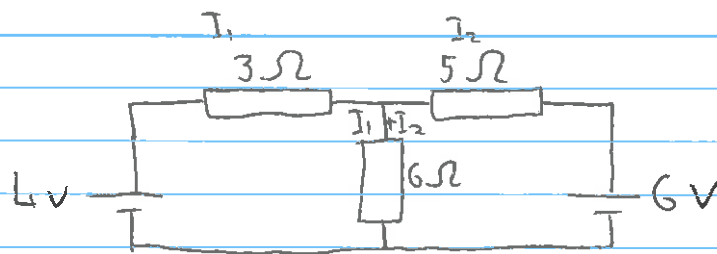
$$iv) \quad \begin{pmatrix} 1 & 3 \\ -1 & -2 \end{pmatrix}$$

$$|A| = 1 \times -2 - -1 \times 3 = 1$$

$$= \frac{1}{1} \begin{pmatrix} -2 & 3 \\ 1 & 1 \end{pmatrix} = \begin{pmatrix} -2 & 3 \\ 1 & 1 \end{pmatrix} \quad \text{Simplify!} \quad (5)$$

SDP

6)



$$\begin{array}{l|l} 4 = 3I_1 + 6(I_1 + I_2) & 6 = 5I_2 + 6(I_1 + I_2) \\ 4 = 3I_1 + 6I_1 + 6I_2 & 6 = 5I_2 + 6I_1 + 6I_2 \\ 4 = 9I_1 + 6I_2 & 6 = 6I_1 + 11I_2 \end{array}$$

$$4 = 9I_1 + 6I_2 \quad \checkmark$$

$$6 = 6I_1 + 11I_2 \quad \checkmark$$

$$\begin{bmatrix} 9 & 6 \\ 6 & 11 \end{bmatrix} \begin{bmatrix} I_1 \\ I_2 \end{bmatrix} = \begin{bmatrix} 4 \\ 6 \end{bmatrix} \quad \checkmark$$

$$I_1 = \frac{\begin{vmatrix} 4 & 6 \\ 6 & 11 \end{vmatrix}}{\begin{vmatrix} 9 & 6 \\ 6 & 11 \end{vmatrix}} = \frac{4 \times 11 - 6 \times 6}{9 \times 11 - 6 \times 6} = \frac{8}{63} = 0.1269 \quad \checkmark$$

$$I_2 = \frac{\begin{vmatrix} 9 & 4 \\ 6 & 6 \end{vmatrix}}{\begin{vmatrix} 9 & 6 \\ 6 & 11 \end{vmatrix}} = \frac{9 \times 6 - 6 \times 4}{9 \times 11 - 6 \times 6} = \frac{30}{63} = 0.4761 \quad \checkmark$$

current through

$$3\Omega = 0.1269 \text{ A} \quad \checkmark$$

$$5\Omega = 0.4761 \text{ A} \quad \checkmark$$

$$6\Omega = 0.1269 + 0.4761 = 0.603 \text{ A} \quad \checkmark$$

(K)  
SDP

1)

$$F_0 = \frac{1}{2\pi\sqrt{LC}}$$

$$\therefore F_0 \times 2\pi = \frac{1}{\sqrt{LC}} \quad \checkmark$$

$$\therefore F_0 \times 2\pi \times 1 = \sqrt{LC} \quad \times$$

$$\therefore F_0 \times 2\pi \times 1 \times L^2 = C$$

①

/

SDP

Question No.

Examiner Only

8)  $150 - 79 \times 12 = 852 \text{ hours}$  +

Rhif y Cwestiwn

Arholwr yn unig

Question No.

Examiner Only