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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: Lovegrove

FORENAME(S): Harris John

1	Student Number	146376
2	Title of Examination Paper	Phase test 1
3	Module Code	PCEE4000
4	Date and Time of Examination	23/01/2019 09:30
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	0
2	16
3	12
4	12
5	15
6	9
7	4
8	0
9	7
Office Use	75 / SDP

1)

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

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

x

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

$$\left(\frac{F_0}{2\pi}\right)^2 = LC$$

$$\frac{\left(\frac{F_0}{2\pi}\right)^2}{L} = C$$

+ 0

2i)

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

$$3x - 15 - 8 + 10x - 3 = 0$$

✓

$$13x - 26 = 0$$

$$13x = 26$$

✓

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

$$x = 2$$

✓

(4)

2ii)

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

~~or~~
$$\frac{-11 + \sqrt{11^2 - 4 \times 3 \times -4}}{2 \times 3} = x = \frac{1}{3}$$

✓

or

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

✓

(6)

2ii)

$$1.5 \times 10^{2x-1} = 153$$

$$10^{2x-1} = \frac{153}{1.5} \checkmark$$

$$10^{2x-1} = 102 \checkmark$$

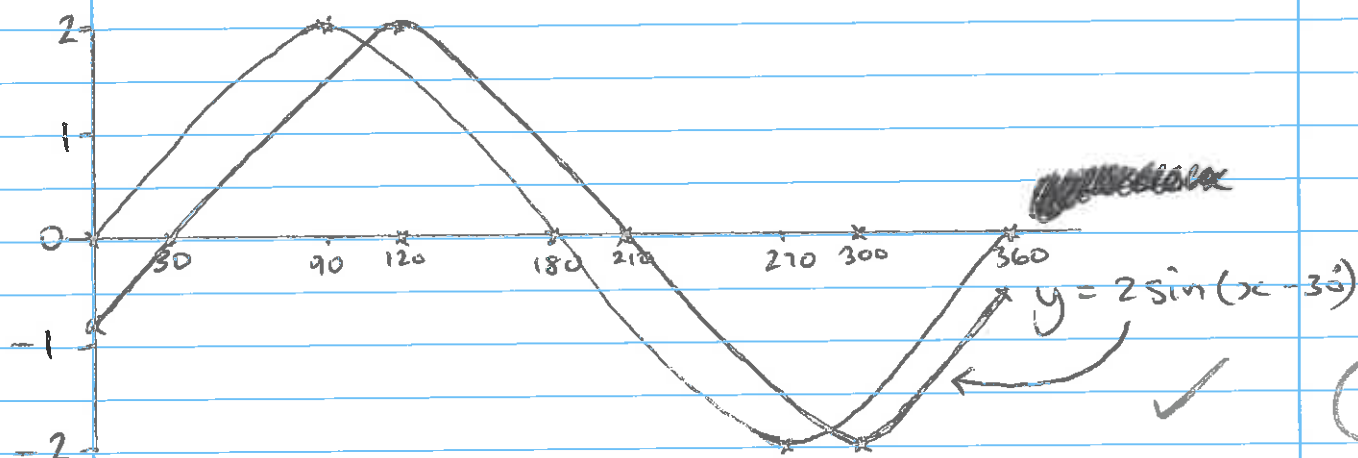
$$x = \frac{\log_{10}(102) + 1}{2} \checkmark$$

$$x = 1.504 \checkmark$$

⑥

500

3i)

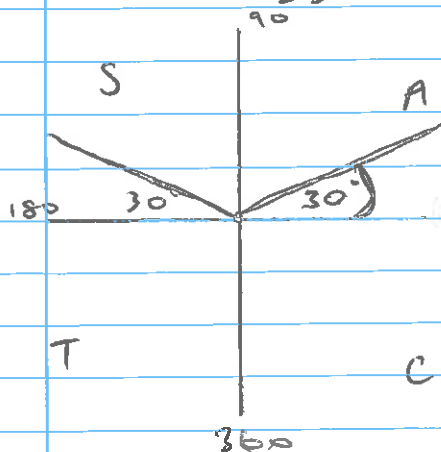


⑥

3ii)

$$\sin 2x = 0.5$$

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



$$2x = 30, (180-30), 360+30, 360+(180-30)$$

$$2x = 30, 150, 390, 510 \checkmark$$

$$x = 15, 75, 195, 255 \checkmark$$

⑥

500

$$4i) \quad z_1 - z_2 = (3 + j2) - (-1 - j5)$$

~~4 + j7~~

$$4 + j7 \quad \checkmark$$

(3)

$$4ii) \quad z_1 z_2 = (3 + j2)(-1 - j5)$$

$$-3 - j15 - j2 - j^2 10$$

$$-3 - j17 - (-1)10$$

$$-3 - j17 + 10$$

$$7 - j17 \quad \checkmark$$

(4)

$$4iii) \quad \frac{z_1}{z_2} = \frac{3 + j2}{-1 - j5} \times \frac{-1 + j5}{-1 + j5} \quad \checkmark$$

$$\frac{-3 + j15 - j2 + j^2 10}{1 - j5 + j5 - j^2 25} \quad \checkmark$$

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

$$\frac{-3 + j13 - 10}{1 + 25}$$

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

$$= -\frac{1}{2} + \frac{j1}{2} \quad \checkmark$$

(5)

$$\text{Si)} \quad 3 \begin{bmatrix} 0 & 1 \\ -3 & 2 \end{bmatrix} - \begin{bmatrix} 1 & 3 \\ -1 & -2 \end{bmatrix}$$

$$\begin{bmatrix} 0 & 3 \\ -9 & 6 \end{bmatrix} - \begin{bmatrix} 1 & 3 \\ -1 & -2 \end{bmatrix} = \begin{bmatrix} -1 & 0 \\ -10 & 4 \end{bmatrix}$$

(2)

$$\text{Sii)} \quad \begin{bmatrix} 1 & 3 \\ -1 & -2 \end{bmatrix} \times \begin{bmatrix} 0 & 1 \\ -3 & 2 \end{bmatrix} = \begin{bmatrix} 0 + -9 & 1 + 6 \\ 0 + 6 & -1 + -4 \end{bmatrix}$$

$$= \begin{bmatrix} -9 & 7 \\ 6 & -5 \end{bmatrix} \checkmark$$

(4)

$$\text{Siii)} \quad \begin{bmatrix} 0 & 1 \\ -3 & 2 \end{bmatrix} \begin{bmatrix} 1 & 3 \\ -1 & -2 \end{bmatrix} = \begin{bmatrix} 0 + -1 & 0 + -2 \\ -3 + -2 & -9 + -4 \end{bmatrix}$$

$$= \begin{bmatrix} -1 & -2 \\ -5 & -13 \end{bmatrix} \neq AB \checkmark$$

(4)

$$\text{Siv)} \quad \begin{bmatrix} 1 & 3 \\ -1 & -2 \end{bmatrix} \quad (1 \times -2) - (-1 \times 3) = -2 - -3$$

$$= 1 \checkmark$$

$$|A| = \frac{1}{1} \begin{bmatrix} -2 & -3 \\ 1 & 1 \end{bmatrix} = \begin{bmatrix} -2 & -3 \\ 1 & 1 \end{bmatrix} \checkmark$$

Simplify!

(5)

SOP

6) $V = I \times R$

$$4 = 3I_1 + 6(I_1 + I_2)$$

$$6 = 5I_2 + 6(I_1 + I_2)$$

~~$$4 = 3I_1 + 6(I_1 + I_2)$$~~

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

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

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

(5)

$$I_1 = \frac{\begin{vmatrix} 4 & 6 \\ 6 & 11 \end{vmatrix}}{\begin{vmatrix} 9 & 6 \\ 6 & 11 \end{vmatrix}} \quad \checkmark$$

$$= \frac{4 \times 11 - 6 \times 6}{9 \times 11 - 6 \times 6} = \frac{80 - 36}{135 - 36} = \frac{44}{99} = \frac{4}{9}$$

$$\begin{vmatrix} 9 & 6 \\ 6 & 11 \end{vmatrix} \quad \checkmark \quad (2)$$

$$I_2 = \frac{\begin{vmatrix} 9 & 4 \\ 6 & 6 \end{vmatrix}}{\begin{vmatrix} 9 & 6 \\ 6 & 11 \end{vmatrix}} \quad \checkmark$$

$$= \frac{9 \times 6 - 4 \times 6}{9 \times 11 - 6 \times 6} = \frac{78}{135 - 36} = \frac{78}{99} = \frac{26}{33}$$

$$\begin{vmatrix} 9 & 6 \\ 6 & 11 \end{vmatrix} \quad \checkmark \quad (2)$$

9

7i) $y = mx + c$

$$m = \frac{8 - 4}{1 - 4} = -4 \quad \checkmark$$

$$y = -4x + c$$

$$8 = -4 \times 1 + c$$

$$8 = -4 + c$$

$$c = 12 \quad \checkmark$$

$$\underline{\underline{8 = -4 \times 1 + 12}}$$

final answer??

(4)

DDP

7ii)

$$y = mx + c$$

$$m = \frac{-1}{-4} = 0.25x$$

$$y = 0.25x + c$$

$$0 = 0.25x - 1 + c$$

$$0 = -0.25 + c$$

$$0.25 = c$$

$$y = 0.25x + 0.25$$

x

⑥

8)

$$a + (n-1) \times d$$

$$150 + (79-1) \times 12$$

$$150 + 78 \times 12$$

$$= 1086$$

x

⑥

9)

$$ar^{n-1}$$

$$a = 10 \quad n = 5 \quad ar^{n-1} = 600$$

$$10r^{5-1} = 600$$

$$10r^4 = 600$$

$$r = \frac{600}{10}$$

$$r = \sqrt[4]{60} \quad \checkmark$$

$$1^{st} \text{ speed} = 10 \times (\sqrt[4]{60})^{1-1} = 10 \text{ rpm}$$

$$2^{nd} \text{ speed} = 10 \times (\sqrt[4]{60})^{2-1} = 28 \text{ rpm} \quad \checkmark$$

$$3^{rd} = 77 \text{ rpm} \quad \checkmark$$

$$4^{th} = 216 \text{ rpm} \quad \checkmark$$

$$5^{th} = 600 \text{ rpm}$$

⑦