

**Complete, fold and seal**  
(see note 2 below)

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## 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 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.**

|   |                                  |                                      |
|---|----------------------------------|--------------------------------------|
| 1 | Student Number                   | 1704018                              |
| 2 | Title of Examination Paper       | Electrical and Electronic Principles |
| 3 | Module Code                      | ACDA4002                             |
| 4 | Date and Time of Examination     | 21st May 2018<br>3:00pm              |
| 5 | Examination Venue                | Town Hill                            |
| 6 | Seat Number                      | G011                                 |
| 7 | Number of Answer Books handed in | 1                                    |

| List the numbers of the questions you have attempted | Office Use |
|------------------------------------------------------|------------|
| 1                                                    | 6          |
| 2                                                    | 3          |
| 3                                                    | 5          |
| 4                                                    | 5          |
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| Total                                                | 19/35      |

(Gweler yr ochr arall am y fersiwn Cymraeg)

54.3%

19/35  
Gang

①

$$A) 1k\Omega + 1k\Omega = 2k\Omega$$

$$1k\Omega + 1k\Omega = 2k\Omega$$

$$\frac{1}{\frac{1}{2000\Omega} + \frac{1}{2000\Omega}} = 1000\Omega$$

$$R_T = 1k\Omega$$

②.

$$B) I_s = \frac{V}{R_T}$$

$$I_s = \frac{12}{1000}$$

$$I_s = 0.012$$

$$I_s = 12mA$$

①.

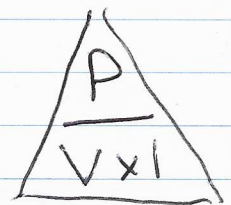
$$C) P = V \times I_s$$

$$P = 12 \times 0.012$$

$$P = 0.144W$$

$$P = 144mW$$

②.



ii)

a)  $40\text{ms}$

①.

b) frequency =  $\frac{\text{Period}}{2\pi}$

$$f = 6.366 \text{ Hz} \quad \times.$$

c)  $2\text{V} + 2\text{V} = 4\text{V}$

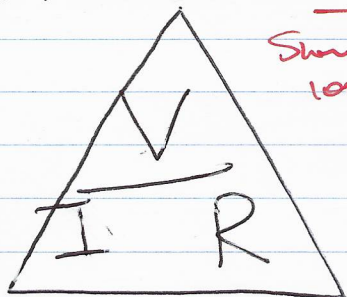
$$\text{PK-PK} = 4\text{V} \quad \times.$$

d) R.M.S

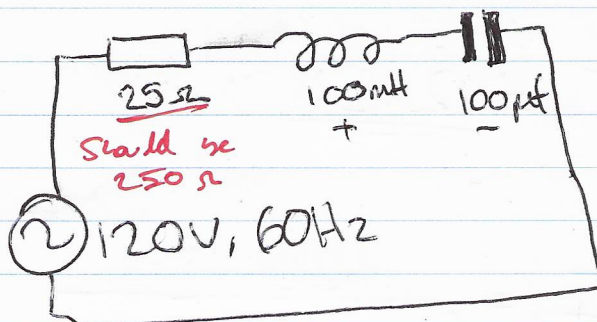
$$\frac{4\text{V}}{\sqrt{2}} = 1.27\text{Vrms.} \quad \times.$$

②  $R = 25\Omega, L = 100\text{ mH}, C = 100\mu\text{F}$

Supply =  $120\text{V}$   $60\text{Hz}$



Should be  
100 Hz



$$X_L = 2\pi fL \quad X_C = \frac{1}{2\pi fC}$$

$$X_L = 2\pi \times 60 \times 100 \times 10^{-3} = 12\pi = 37.699\Omega$$

$$X_C = \frac{1}{2\pi \times 60 \times 100 \times 10^{-6}} = \frac{6}{5}\pi = 3.77\Omega = 0.265\Omega$$

$$Z = 25 + 37.699 + 0.265\Omega = 62.964\Omega$$

i) Resistor  $= V = I \times R$

$$\frac{V_N - 120}{25} + \frac{V_N - 120}{37.699} + \frac{V_N - 120}{0.265} = 0$$

$$62.434 \left( \frac{V_N - 120}{62.434} \right) = 0 \times 62.434$$

$$\frac{120}{62.434} = 1.922\text{A}$$

$$V_N - 120 = 0$$

$$\text{Total } Z = 62.964 \text{ } \times$$

Question No.

2.1

$$I_R = \frac{120}{(1.9 \times 25)}$$

$$I_R = \underline{\underline{2.5 \text{ A}}} \times$$

ii

$$I_c = \frac{120}{(1.9 \times 0.265)}$$

$$= 23 \text{ A}$$

$$I_L = \frac{120}{(1.9 \times \cancel{0.167} 37.699)}$$

$$= 0.167 \text{ A}$$

$$= 167 \text{ mA} \times$$

B

resonance frequency.

10000

$$\frac{1}{2\pi f 100 \times 10^{-4}} - 2\pi f 100 \times 10^{-3} = 0 \quad \text{①}$$

$$1 - 2\pi f 100 \times 10^{-4} (2\pi f 100 \times 10^{-3}) = 0$$

$$\frac{1}{f} - 2\pi 100 \times 10^{-4} (2\pi 100 \times 10^{-3}) = 0$$

$$\frac{1}{f} = 4\pi^2 \times 1 \times 10^{-3}$$

$$\frac{1}{f} = 0.03947 \dots$$

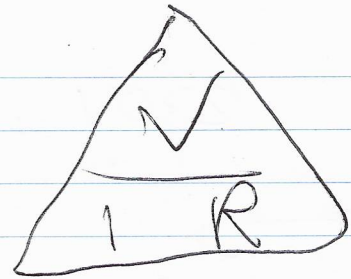
$$\frac{f}{1} = \frac{1}{0.03947}$$

$$f = 25.33 \text{ Hz}$$

(C is 2 pages after this)  $\times$

3

$$\frac{V_N - 10}{10}$$



$$\frac{V_N - 20}{10}$$

$$\frac{V_N}{20}$$

$$\frac{V_N - 10}{10} + \frac{V_N - 20}{10} + \frac{V_N}{20}$$

$$0 = V_N - 10 + \frac{V_N - 20}{10} + \frac{V_N}{20}$$

$$0 = (V_N - 10) + \frac{1}{10}(V_N - 20) + \frac{1}{20}V_N$$

$$0 = 20(V_N - 10) + 20(V_N - 20) + 10V_N$$

$$0 = 20V_N - 200 + 20V_N - 400 + 10V_N$$

$$20V_N + 20V_N + 10V_N = 200 + 400$$

$$50V_N = 600$$

$$V_N = \frac{600}{50}$$

$$V_N = 12$$

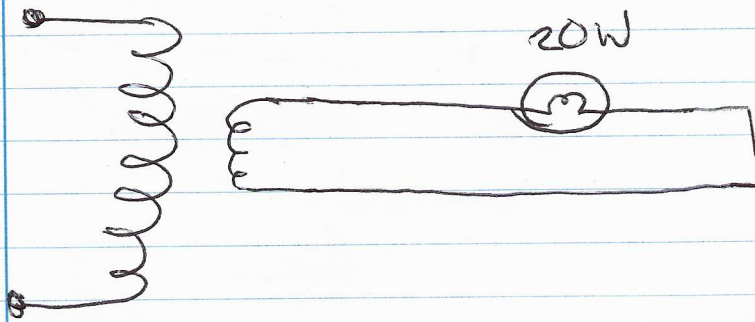
$$I_{20\Omega} = \frac{V}{R} = \frac{12}{20} = 0.6A$$

$$\underline{I = 600mA}$$

5

(4)

230V stepdown



$$(B) \quad 230 \div 20$$

$$= 11.5V \quad \checkmark$$

~~$$I = \frac{20}{11.5}$$~~

$$I = 1.7A \quad \checkmark$$

(C)

$$I = \frac{1.7}{20}$$

$$I = 0.085A$$

$$I = 85mA \quad \checkmark$$

$$\frac{V}{1 \times R}$$

~~$$\frac{P}{V \times I}$$~~

(1)

(2)

(2)

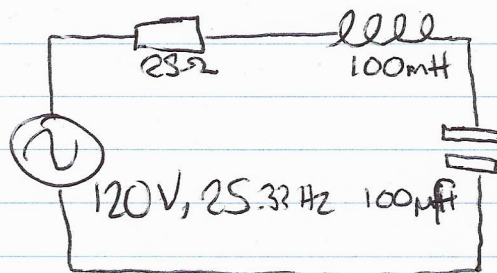
2

c. At resonant frequency calculate  $I_T$

$$f = 25.33 \text{ Hz}$$

$$\frac{V}{I \times R}$$

~~$$I = \frac{V}{R} = \frac{120}{37.7} = 0.265 \text{ A}$$~~



$$I = \frac{V}{R} \quad I$$

$$X_L = 2\pi fL \quad \checkmark$$

$$= 2\pi \times 25.33 \times 100 \times 10^{-3}$$

$$= 15.9153 \Omega$$

$$X_C = \frac{1}{2\pi fC} \quad \checkmark$$

$$= \frac{1}{2\pi \times 100 \times 10^{-4} \times 25.33}$$

$$= 0.62832 \Omega$$

$$I_T = \frac{V}{R} \quad \times \quad I = \frac{V}{Z}$$

$$I_T = \frac{120}{25 + 15.9153 + 0.62832}$$

$$I_T = 2.88 \text{ A} \quad \times$$

@ resonance  $X_L = X_C \therefore I = \frac{V}{R}$   
 $I = \frac{120}{25} = 0.48 \text{ A}$