

12 Pages

1. Please give the information requested in the boxes below.
2. Enter your name in the space provided to the right, fold over the flap and seal down (using the label provided) to hide your name.
3. The answers must be legibly written. The Examiners can either read 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	241022S
2	Title of Examination Paper	ELECTRICAL ELECTRONIC PRINCIPLES
3	Module Code	ACDA4006
4	Date and Time of Examination	0900 13/5/28
5	Examination Venue	IQ Swensen 307
6	Seat Number	
7	Number of Answer Books handed in	

List the numbers of the questions you have attempted	Office Use
1	25 ✓
2	13 + 5
3	20 ✓
4	2 ✓
Total	60 %

(Gweler yr ochr arall am y fersiwn Cymraeg)

Examiner Only

①

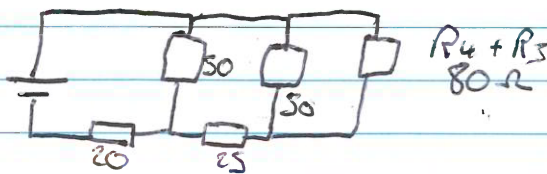
$$\text{a) Efficiency} = \frac{P_{\text{out}}}{P_{\text{in}}} = \frac{20 \text{ W}}{25 \text{ W}} = 80\%$$

$$P_{\text{loss}} = P_{\text{in}} - P_{\text{out}} = 25 - 20 = 5 \text{ W}$$

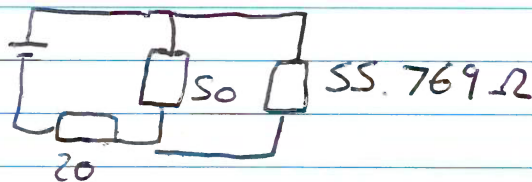
②

$$I = \frac{P}{V} = \frac{1}{3} = 0.333 \text{ A}$$

③



$$\frac{1}{R_{\text{eq}}} = \frac{1}{50} + \frac{1}{80} = 30.769 \Omega$$



$$\frac{1}{50} + \frac{1}{30.769} = 26.364$$

④

$$26.364 + 20 = 46.364 \Omega = R_T$$

⑤

$$I = \frac{V}{R} = \frac{15}{46.364} = 0.324 \text{ A}$$

d)

$$R_1 = 10\Omega$$

$$R_2 = 10\Omega$$

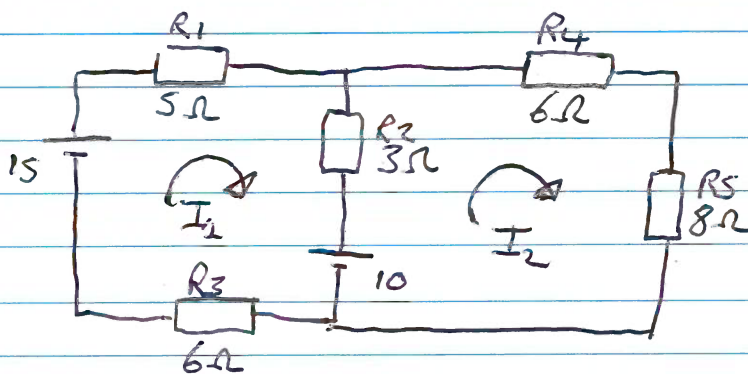
$$R_3 = 10\Omega$$

$$R_4 = 10\Omega$$

$$R_5 = 10\Omega$$

e) Sum of all currents ~~may~~ must equal to zero.

2 a)



Q. total.

$$\frac{25}{25}$$

$$15 + 5I_1 + 3I_1 - 3I_2 - 10 + 6I_1 = 0$$

$$5 + 14I_1 - 3I_2 = 0$$

$$14I_1 - 3I_2 = -5$$

$$10 + 3I_2 - 3I_1 + 6I_2 + 8I_2 = 0$$

$$-3I_1 + 17I_2 = -10$$

$$14I_1 - 3I_2 = -5 \quad \times 3$$

$$-3I_1 + 17I_2 = -10 \quad \times 14$$

$$42I_1 - 9I_2 = -15$$

$$-42I_1 + 238I_2 = -140$$

$$229I_2 = -125$$

$$I_2 = -0.546 \text{ A}$$

$$42I_1 - 9(-0.546) = 15$$

$$42I_1 = 10.086$$

$$I_1 = 0.24 \text{ A}$$

$$42I_1 - 9I_2 = -15$$

$$42I_1 - 238I_2 = +140$$

$$-247I_2 = 125$$

$$I_2 = -0.506 \text{ A}$$

$$14I_1 - 3(-0.506) = -5$$

$$14I_1 + 1.518 = -5$$

$$14I_1 = -6.518$$

$$I_1 = -0.466 \text{ A}$$

$$R_1 = -0.466 \text{ A}$$

$$R_2 = -0.04 \text{ A}$$

$$R_3 = -0.466 \text{ A}$$

$$R_4 = -0.506 \text{ A}$$

$$R_5 = -0.506 \text{ A}$$

b
i

$$X_L = 2\pi fL$$

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

$$Z = \sqrt{R^2 + (X_C - X_L)^2}$$

$$X_L = 2\pi \times 50 \times 1 \times 10^{-3}$$

$$= 0.314 \Omega$$

$$X_C = \frac{1}{2\pi \times 50 \times 70 \times 10^{-6}}$$

$$X_C = 6.773 \Omega$$

$$Z = \sqrt{(100)^2 + (X_C - X_L)^2}$$

$$Z = 100.208 \Omega$$

ii) $I = \frac{V}{R}$

$$I = \frac{119.8}{100} = 1.1975 A$$

iii) $\phi = \tan^{-1} \left(\frac{X_C - X_L}{R} \right)$

$$= 3.6956^\circ$$

Q2 total 13
25

(3)

(i) opposition to the Rate of flow of charge ✓ 2.

(ii) opposition to the change in Rate of flow of charge ✓ 2.

(iii) Change in Impedance at a given Frequency. ✗

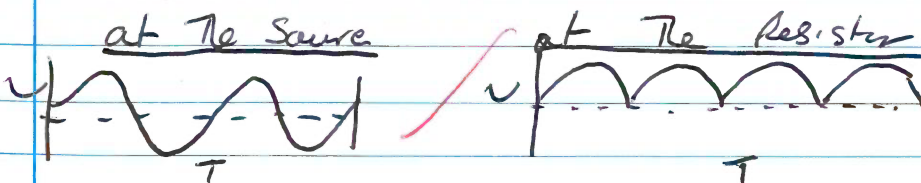
(iv) absolute maximum voltage before breakdown of insulation ✓ 1.

(b) (i) 40 A ✓ 1.

(ii) $40 \times 0.707 = 28.28 \text{ A}$ ✓ 2.

(iii) ~~100~~ $314 \div \pi = 99.95 \text{ Hz}$ ✗

(c) The ~~circuit~~ circuit takes AC power and supplies a lower DC power to RL. It does this by using a step down Transformer (x1) which has a lower number of turns on the secondary winding compared to the primary winding/coil. D1-D4 act as a AC-DC Rectifier as positive AC voltage leaves the transformer it passes through D2 → R1 → D4. When the voltage is negative from the transformer, it passes D3 → R1 → D1.



12

Q3 total $\frac{20}{25}$

4
a

$$P = \frac{V^2}{R}$$

$$P = \frac{(12)^2}{12 + R_L}$$

Load (Ω)	Power (W)
4	0.75
8	0.6
12	0.5
16	0.429
20	0.375

b on graph paper.

2

question 4 b

2410225

Load power vs
Load Resistance

