



9.09 mA

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Examination Answer Books

12 Pages

Instructions to Candidates

- Please give the information requested in the boxes below.
- 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.
- The answers must be legibly written. The Examinations fee is charged to the candidate.
- Write your answers in ink.
- Begin each answer on a fresh page. Do all rough work in the answer book and cross it through.
- No part of this book is to be torn out; it must be handed in complete.
- If more books than one are used, fasten them together using the tags available from the invigilator(s).
- 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	2315404
2	Title of Examination Paper	Electrical & Electronic Principles
3	Module Code	ACDA4006
4	Date and Time of Examination	9/1/23 12.00
5	Examination Venue	TQ 310
6	Seat Number	31
7	Number of Answer Books handed in	1

[illegible]

(Gweler yr ochr arall am y fersiwn Cymraeg)

$$46 \overline{) 100}$$

1.

$$a) \quad V = IR \quad \therefore I = \frac{V}{R} = \frac{3}{330} = 9.09 \text{ mA} //$$

$$I = \frac{V}{R} = \frac{3}{270} = 11.11 \text{ mA} //$$

1.

$$b) \quad P = VI \quad \therefore \text{~~calculate~~ } I = \frac{P}{V}$$

$$I = 0.33 \text{ A} //$$

1. e)

$$\text{efficiency} = \frac{\text{out}}{I_n} = \frac{20}{25} = 0.8$$

$$\% \text{ efficiency} = \text{efficiency} \times 100 = 80\% //$$

$$\text{Total power loss} = I_n - \text{out} = 25 - 20 = 5 \text{ W} //$$

2.

a) ~~Resistance~~

c) i) Circuits ~~object~~ ~~object~~ ability to reject flow of current - DC circuit attribute. //

ii) Circuits ability to reject change in direction of flow of current - AC circuit attribute. //

2. d)

- Step up transformer has more ^{turns} ~~coils~~ in the secondary coil than the primary, where step down transformers have more turns in the primary coil

- Step up transformer rated for voltages ~~increases~~ greater than 10,000 V. Step down ~~rated~~ for ~~lesser~~ voltages i.e. 240V, 110V, ect.

4.

a) i) $I_{max} = 40A$

ii) $RMS = \frac{40}{\sqrt{2}} = 28.28A$

iii) $\omega = 314$

$\omega = 2\pi f \quad f = \frac{\omega}{2\pi}$

$f = 49.97 Hz$

4. c) 1/BJT - N-Type

2/BJT - P-Type

3/MOSFET - P-Type

4/MOSFET - N-Type

5a) $P = I^2 R$ $P = VI$ $P = \frac{V^2}{R}$ $V^2 = 144$

4	$144/16 = 9$
8	$144/20 = 7.2$
12	$144/24 = 6$
16	$144/28 = 5.1$
20	$144/32 = 4.5$

Load resistance (R)	Load Power (W)
4	9
8	7.2
12	6
16	5.1
20	4.5

5 c)

Transistor Radio
Television

3. ~~3~~

$$b) i) X_L = \frac{1}{2\pi fC} = \frac{1}{2\pi (1500 \text{ Hz})(0.022 \times 10^{-6})} = 4822.88 \text{ H}$$

$$= 4.82 \text{ MH} //$$

~~2200~~

$$3b) ii) Z = \sqrt{R^2 + X_L^2} = \sqrt{(2200)^2 + (4822.88)^2}$$

$$= 5300.46 //$$

$$3b) iii) V = IR \quad I = \frac{V}{R} = \frac{10}{2200} = 4.55 \text{ mA}$$

$$= 4.55 \text{ mA} //$$

3.

A) KVL across AB EF

$$-5I_1 - 3(I_1 - I_2) - 5 + 2I_1 + 20 = 0$$

$$-5I_1 - 3I_1 + 3I_2 + 2I_1 + 15 = 0$$

$$-6I_1 + 3I_2 = 15 \quad (1)$$

KVL across BCDE

$$-6I_2 - 7I_2 - 2I_2 + 5 + 3(I_1 - I_2) = 0$$

$$-6I_2 - 7I_2 - 2I_2 + 5 + 3I_1 - 3I_2 = 0$$

$$-18I_2 + 3I_1 = 5 \quad (2)$$

$$3I_1 - 18I_2 = 5$$

$$\textcircled{1} \times -2 \quad -6I_1 + 36I_2 = -10$$

$$-10 \quad -6I_1 + 3I_2 = 15$$

$$33I_2 = -25$$

$$I_2 = -0.7575 \text{ A}$$

$$I_2 = 0.76 \text{ A}$$

(can't have negative current so direction was wrong in workings)

$$\begin{array}{r} -25 \\ 33 \\ \hline = -0.7575 \end{array}$$

[CONT OVER LEAF]

3 A) Sub in I_2 to equation 1

$$-6I_1 + 3I_2 = 15$$

$$-6I_1 + 3(0.76) = 15$$

$$-6I_1 + 2.28 = 15$$

$$-6I_1 = 12.72$$

(Again wrong direction
↗ assumed)

$$I_1 = -2.12 = 2.12 \text{ A} //$$

$$\therefore R_1, R_3 = 2.12 \text{ A} //$$

$$R_4, R_5, R_6 = 0.76 \text{ A} //$$

$$R_2 = 2.12 - 0.76 = 1.36 \text{ A} //$$

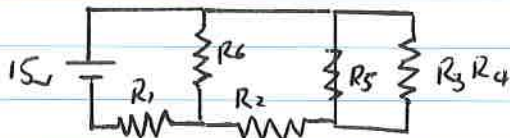
0
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15

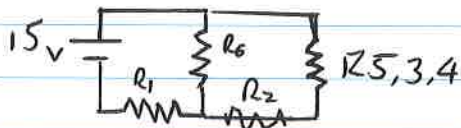
Q3 = 15

1 D)

i)

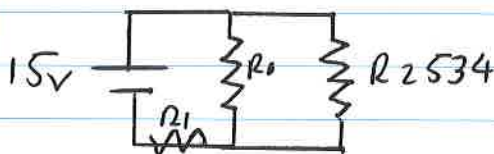


$$R_3 R_4 = R_3 + R_4 = 30 + 30 = 80 \Omega //$$



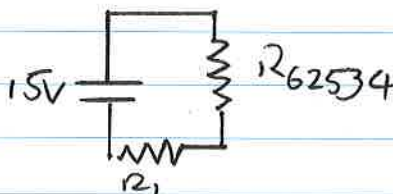
$$R_{2534} = \left(\frac{1}{R_3 R_4} + \frac{1}{R_5} \right)^{-1}$$

$$= \left(\frac{1}{80} + \frac{1}{50} \right)^{-1} = 30.769 \Omega //$$



$$R_{2534} = R_2 + R_{534}$$

$$= 25 + 30.769 = 55.769 \Omega //$$

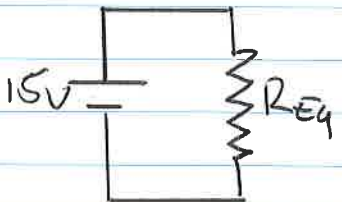


$$R_{62534} = \left(\frac{1}{R_{2534}} + \frac{1}{R_6} \right)^{-1}$$

$$= \left(\frac{1}{55.769} + \frac{1}{50} \right)^{-1} = 26.364 \Omega //$$

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10.i)
(cont)



$$R_{EQ} = R_{62534} + R_1$$

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

$$\therefore R_{EQ} = 46.364 \Omega //$$

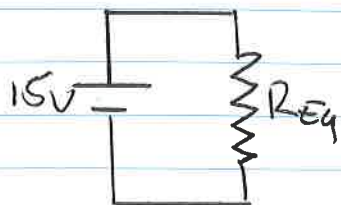
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10.ii)

$$V = IR$$

$$I = \frac{V}{R} = \frac{15}{20} = 0.75A //$$

0

10.i)
(cont)

$$R_{EQ} = R_{62534} + R_1$$

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

$$\therefore R_{EQ} = 46.364 \Omega //$$

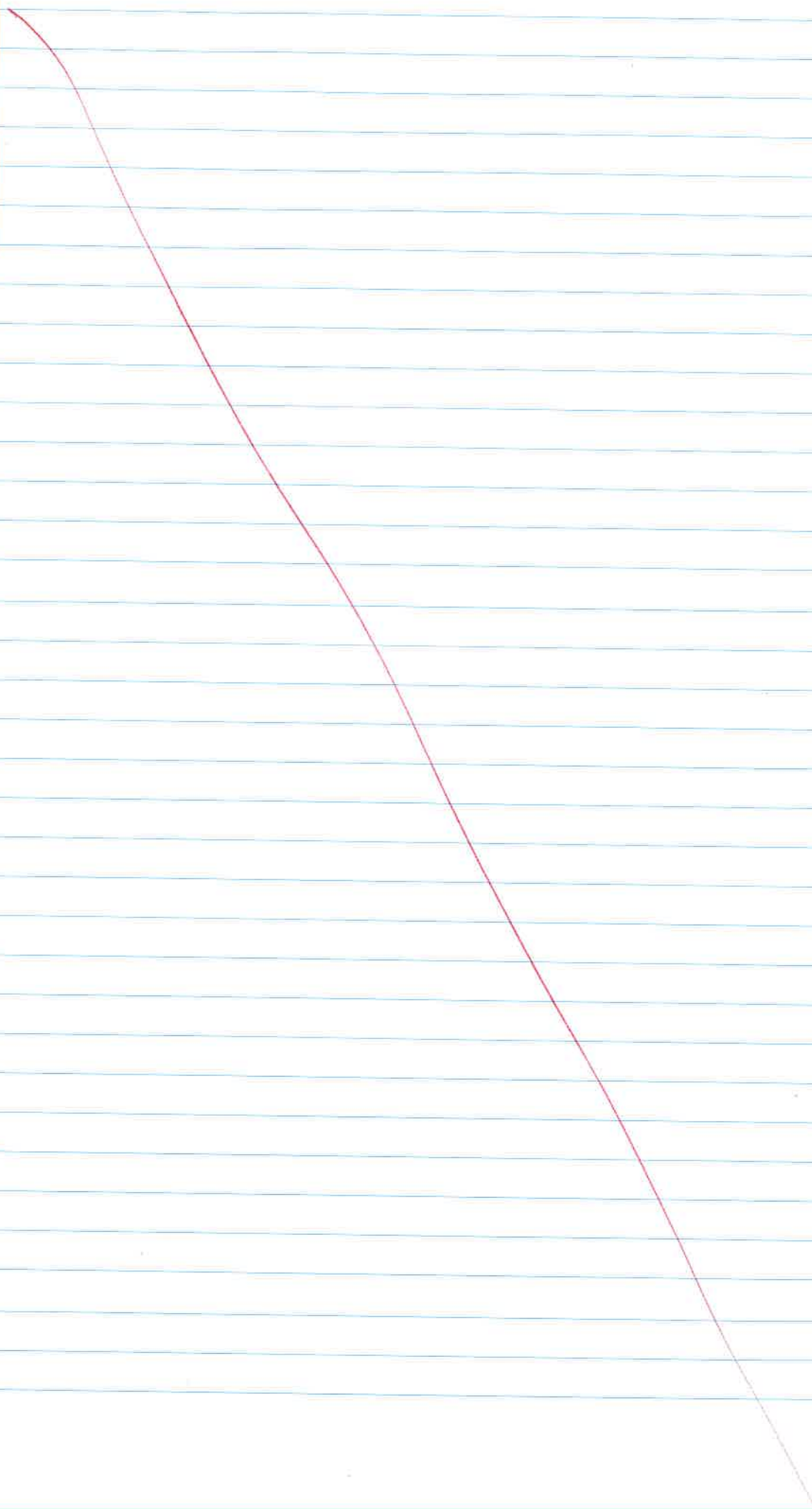
10.ii)

$$V = IR$$

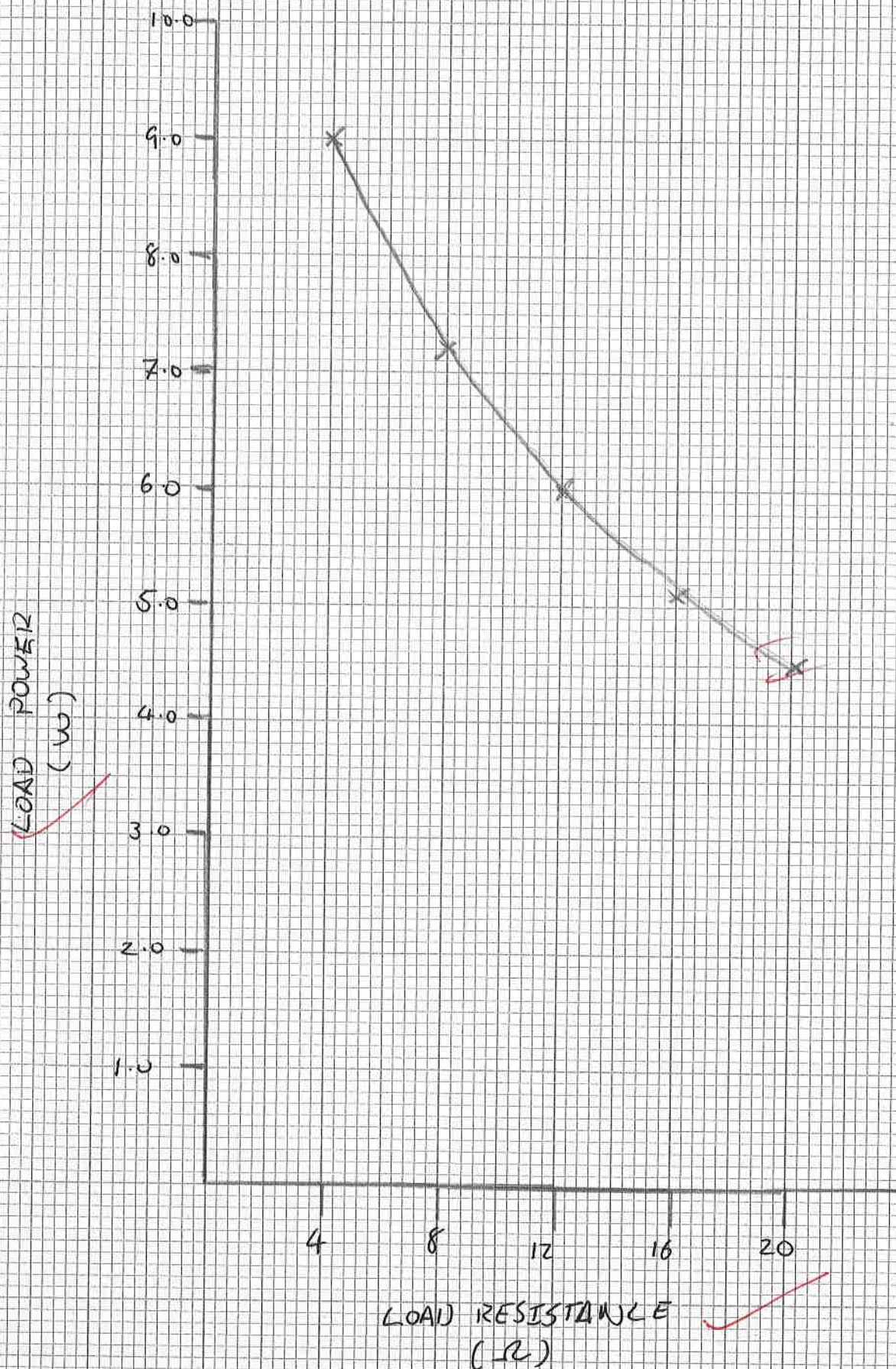
$$I = \frac{V}{R} = \frac{15}{20} = 0.75A //$$

Question No.

Examiner Only



GRAPH COMPARING LOAD RESISTANCE (R)
AND LOAD POWER (W).



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