

SURNAME: Scriven

FORENAME(S): Jack

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 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.**

1	Student Number	
2	Title of Examination Paper	Engineering Science
3	Module Code	PCP04001
4	Date and Time of Examination	11/5/22
5	Examination Venue	Pembrokeshire College
6	Seat Number	
7	Number of Answer Books handed in	

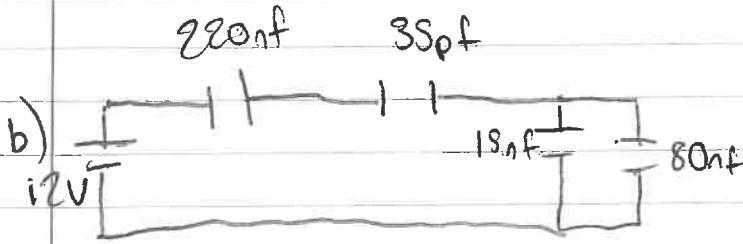
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2
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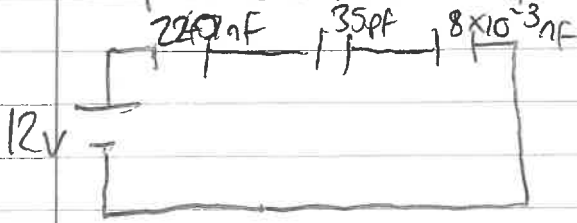
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VR

1.

$$A. \quad 15 \times 10^3 + 60 = 15060 \Omega \\ = 15.1 \Omega$$



$$C_p = 80 \times 10^{-9} + 15 \times 10^{-17} = 8 \times 10^{-3} \text{ nF}$$



$$\frac{1}{C} = \frac{1}{220 \times 10^{-6}} + \frac{1}{35 \times 10^{-9}} + \frac{1}{8 \times 10^{-3} \text{ nF}}$$

Total ~~energy~~ ^{charge} = ~~$\frac{1}{2} CV^2$~~ $Q = CV$

$$t = \frac{Q}{I}$$

Total energy = $e = \frac{CV^2}{2}$

Q2.
A. $R = \rho \frac{L}{A}$

$$24 = \frac{\rho \times 6.2}{\pi \times (0.00025)^2}$$

$$\rho = \frac{24 \times \pi \times (0.00025)^2}{6.2} = 7.60 \times 10^{-7} \Omega/m$$

$$R = \rho \frac{L}{A} = \frac{7.6 \times 10^{-7} \times 6.2 \times 5}{\pi \times (0.0005)^2}$$

$$R = 9.88 \Omega$$

B)

$$3a) \frac{1}{f} = \frac{1}{d_o} + \frac{1}{d_i}$$

$$f = 20 \quad d_o = 40$$

$$\frac{1}{20} = \frac{1}{40} + \frac{1}{d_i}$$

2

$$\frac{1}{20} - \frac{1}{40} = \frac{1}{d_i} \quad d_i = \frac{1}{\frac{1}{f} - \frac{1}{d_o}} = \frac{1}{\frac{1}{20} - \frac{1}{40}}$$

2

$$\frac{3-1}{40} = \frac{1}{d_i} \therefore \frac{40}{2} = 20 \text{ cm} \quad d_i = 20 \text{ cm}$$

$$3b) \frac{h_i}{h_o} = -\frac{d_i}{d_o} \therefore \frac{h_i}{4} = -\frac{20}{40}$$

$$h_i = 4 \times -\left(\frac{20}{40}\right) = -2 \text{ cm} \quad h_i = -2 \text{ cm}$$

$$\frac{1}{f} = \frac{1}{d_i} + \frac{1}{d_o}$$

2

$$-\frac{1}{15.2} = \frac{1}{d_i} + \frac{1}{30.5}$$

2

$$\frac{1}{d_i} = -\frac{1}{15.2} - \frac{1}{30.5} \quad d_i = -0.09 \text{ cm}$$

2

$$\frac{h_i}{h_o} = -\frac{d_i}{d_o} \quad \frac{h_i}{5} = -\left(\frac{-0.09}{30.5}\right)$$

$$h_i = 5 \times 0.015 = 0.075 \text{ cm} \quad h_i = 0.075 \text{ cm}$$

Q4

A)

$$\frac{1}{d} = \frac{1}{d_o} + \frac{1}{d_i}$$

$$\frac{1}{38} = \frac{1}{18} + \frac{1}{d_i} \quad \checkmark \quad d_i = \frac{1}{\frac{1}{f} + \frac{1}{d_o}} = \frac{1}{\frac{1}{38} + \frac{1}{18}} = \frac{56}{2} = 28 \text{ cm} \quad d_i = 28$$

Image is real

Q4

B)

$$n_i \sin \theta_i = n_r \sin \theta_r$$

$$1.5 \sin 48^\circ = 1.33 \sin \theta_r$$

$$\theta_r = 1.1^\circ = \text{ANS}$$

$$\frac{n_i \sin \theta_i}{n_r} = \sin^{-1} (\text{ANS}) =$$

$$\frac{1.5 \sin(48)}{1.33} \quad \checkmark$$

$$C) \quad h_o = 4 \text{ cm} \quad d_o = 25 \text{ cm} \quad f = -35$$

$$\frac{1}{f} = \frac{1}{d_i} + \frac{1}{d_o(25)}$$

$$d_i = -\frac{1}{\frac{1}{35} + \frac{1}{25}} = -14.58 \text{ cm}$$

$$\frac{h_i}{h_o} = -\frac{d_i}{d_o} \quad h_i = 4 \times -\left(\frac{-14.58}{25}\right) = 2.33 \text{ cm}$$

$$h_i = 2.33 \text{ cm}$$

Q5)

A)

C

✓ 22