

Electronics exam

by Anna Katherine Williams

Submission date: 14-Jan-2022 12:07PM (UTC+0000)

Submission ID: 168966550

File name: 27254_Anna_Katherine_Williams_Electronics_exam_395682_818620175.docx (2.11M)

Word count: 21

Character count: 158

ELECTRICAL AND ELECTRONIC PRINCIPLES EXAM SUBMISSION

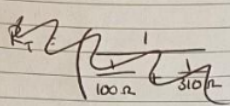
MODULE CODE: ACDA4006 Electrical & Electronic Principles

STUDENT: Anna Katherine Victoria Williams (2023597)

DATE: 14/01/2022

Electronics exam

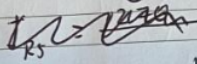
1a. Total resistance


$$R_T = \left(\frac{1}{\frac{1}{100\Omega} + \frac{1}{310\Omega}} \right) + \left(\frac{1}{\frac{1}{270\Omega} + \frac{1}{750\Omega} + \frac{1}{150\Omega} + \frac{1}{330\Omega}} \right) + 470\Omega$$
$$= 410 + 93.66 + 470$$
$$= 973.66 \Omega$$

b. Total current

$$I = \frac{V}{R}$$
$$= \frac{15}{973.66}$$
$$= 0.0154 \text{ mA}$$

c. Current through R3


$$I_{R5} = \frac{150}{270 + 150} \times 0.0154$$
$$= 0.005502 \text{ mA}$$

d. total power delivered by battery

$$P_{\text{Power}} = V \times I$$

$$= 15 \times 0.0154$$

$$= 0.231 \text{ watts}$$

e. power dissipated by R_4

$$P = V_{BE} I_B + V_{CE} I_C$$

$$P = V_{CE} I_C$$

$$P_{R_4} = I_C^2 R_4$$

$$P = 1 \text{ W}$$

$$= I^2 R_4$$

$$= (0.154)^2 \times 330 \Omega$$

$$= 7.82628 \text{ W}$$

f.

$$2a. \text{Period} = 4 \times 100 \text{ ms} \\ = 400 \text{ ms}$$

$$b. f = \frac{1}{T} \\ = \frac{1}{400} \\ = 0.0025 \text{ Hz}$$

$$c. V_{pk-pk} = 4 \times 500 \\ = 2000 \text{ V}$$

$$d. V_{rms} = \frac{V_{pk}}{\sqrt{2}} \\ = \frac{4}{\sqrt{2}} \\ = 0.1789 \text{ V}$$

$$3a. V_c = V_0 (e^{-\frac{t}{\tau}}) \\ = 12 (e^{-1.6}) \\ = 2.423 \text{ V}$$

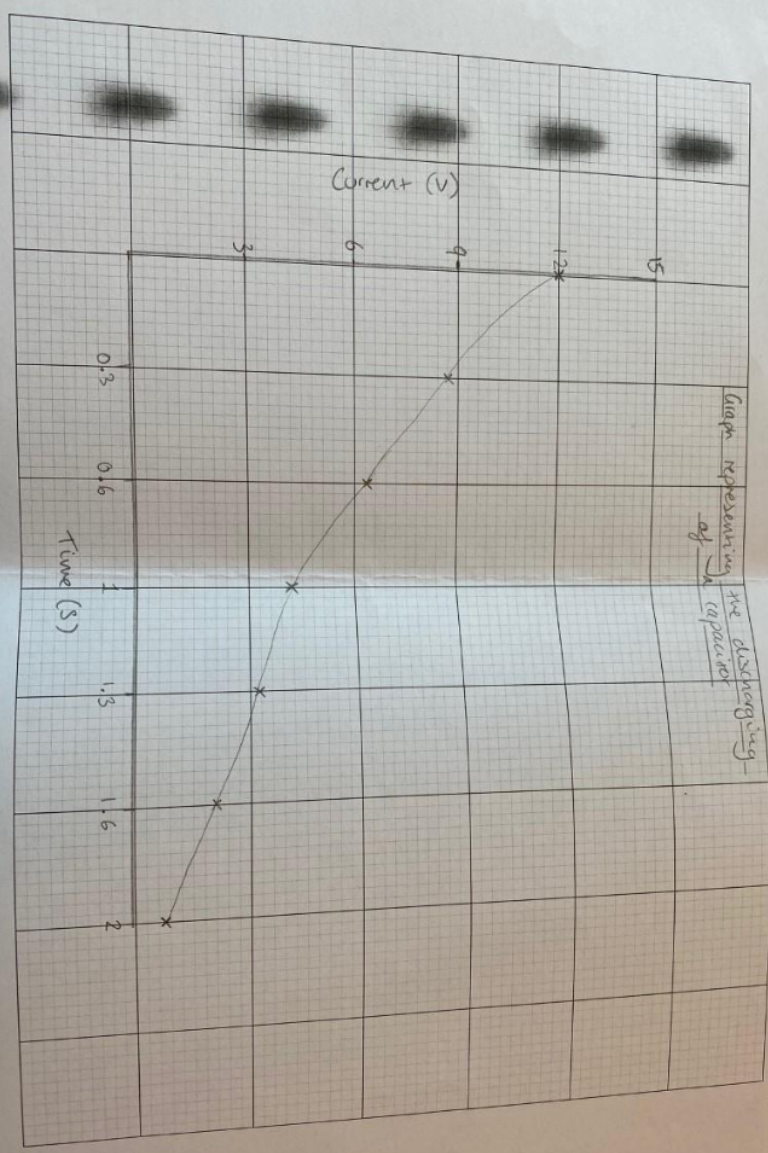
b. See sketch paper

$$c. V_c = 12 \times e^0 \\ = 12$$

$$d. 0.1 = 12 \times e^{-t} \\ e^{-t} = \frac{1}{120} \\ \log e^{-t} = -2.079 \\ t = 2.079 \text{ s}$$

1. In this experiment, we have used a battery.

Graph representing the discharging of a capacitor



4a. Total Impedance

$$X_L = 2\pi fL$$

$$= 2\pi \times 1 \times 100 \times 200$$

$$= 125663.7 \, \Omega$$

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

$$= \frac{1}{2\pi \times 1 \times 100 \times 5}$$

$$= 0.000318 \, \Omega$$

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

$$= \sqrt{200^2 + (125663.7)^2}$$

$$= \sqrt{200^2 + 1.579 \times 10^{10}}$$

$$= \sqrt{1.579 \times 10^{10}}$$

$$= 125663.7005 \, \Omega$$

b. Total current

$$I = \frac{V}{Z}$$

$$= \frac{20}{125663.7005}$$

$$= 0.000159 \, A$$

$$c. \quad ps = \frac{360 \text{ ed}}{P}$$

CIVIL

Circuit is Capacitive 4 phase difference
is current leads voltage by 90°

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

$$= \frac{0.000151}{200}$$

$$= 7.95 \times 10^{-7} \text{ A}$$

$$e. \quad V_c = \frac{Q}{C}$$

$$Q = \frac{1}{R} \sqrt{\frac{L}{C}}$$

$$= \frac{1}{200} \sqrt{\frac{5}{200}}$$

$$= \frac{0.158}{200}$$

$$= 0.0007906 \text{ V}$$

$$= \frac{\sqrt{10}}{20} = 0.158$$

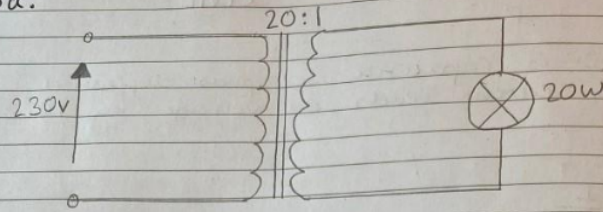
f.

$$g. \quad \cancel{Z_{in}} \quad R + X_L - X_C$$

$$= 200 + 1.579 \times 10^{10}$$

$$= \cancel{200} + 1.579 \times 10^{10} \text{ H}$$

5a.

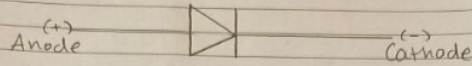


$$\begin{aligned} b. \quad V_s &= V_p \times \frac{1}{N} \\ &= 230 \times \frac{1}{20} \\ &= 11.5 \text{ V} \end{aligned}$$

$$\begin{aligned} I &= \frac{P}{V} \\ &= \frac{20 \text{ W}}{11.5 \text{ V}} \\ &= 1.739 \text{ A} \end{aligned}$$

$$\begin{aligned} c. \quad I_p &= \frac{P}{V_p} \\ &= \frac{20 \text{ W}}{230 \text{ V}} \\ &= 87 \text{ mA} \end{aligned}$$

6a.



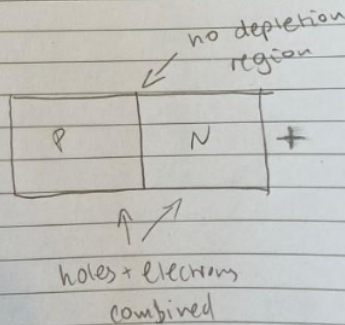
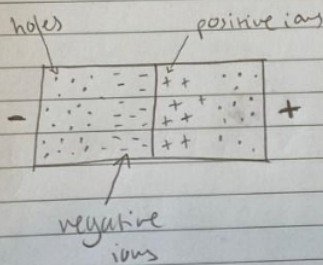
b. Forward bias on a diode means putting the voltage across the diode to make the current flow easily, and reverse bias puts the voltage in the opposite direction.

In a ~~forward~~^{reverse} bias, electrons from the circuit create more negative ions and positive ions are created as electrons are displaced towards the positive terminal of the voltage source. This means that the voltage would increase until the voltage across the two sections is equal.

In a forward bias, electrons and holes move toward the junction as they are repelled from the positive and negative terminals. This means that the electrons and holes meet at the terminal and combine, allowing current flow.

Reverse bias

Forward bias



Electronics exam

GRADEMARK REPORT

FINAL GRADE

47 / 100

GENERAL COMMENTS

Instructor

33 Marks total out of 70

$33 / 70 \times 100\% = 47\%$

Q1 - 7 Marks total

- a) 2 Marks (incorrect circuit used - R4 & R7 are actually in parallel)
- b) 1 Marks (Error Carried Forward should be 15.4mA or 0.0154 A)
- c) 1 Mark (ECF - R4 needs to be included)
- d) 2 Marks (ECF)
- e) 1 Mark (ECF - incorrect current used)
- f) 0 Marks

Q2 - 1 Mark

- a) 1 Mark
- b) 0 Marks
- c) 0 Marks
- d) 0 Marks

Q3 - 6 Marks total

- a) 2 Marks - missing T from exponent
- b) 4 Marks - incorrect values

c) 0 Marks

d) 0 Marks

Q4 - 3 Marks total

a) 1 Mark - SI Prefix problems

b) 2 Marks (ECF)

c) 0 Marks

d) 0 Marks

e) 0 Marks

f) 0 Marks

g) 0 Marks

Q5 - 6 Marks total

a) 2 Marks

b) 2 Marks

c) 2 Marks

Q6 - 10 Marks total

a) 2 Marks

b) 8 Marks

PAGE 1

PAGE 2



Comment 1

This is the total current, not the current flowing through R4

PAGE 3



Comment 2

0.1mj, not 0.1V

PAGE 4

PAGE 5



Comment 3

You seem to have a lot of trouble with indices and engineering notation and the SI prefixes.

PAGE 6



Comment 4

Phase = $\text{Tan}^{-1}(X/R)$



Comment 5

$V = I \times R$

PAGE 7

PAGE 8
