

10/05/2020
TIME: 13:00

Page 1 of 14

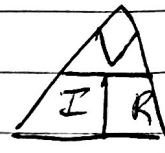
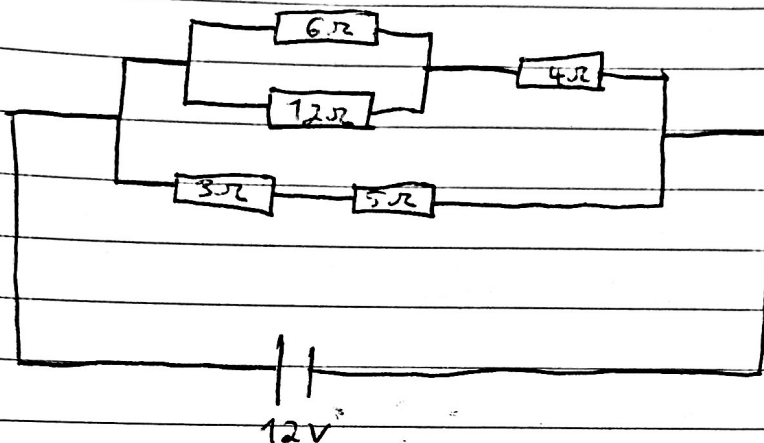
Student ID: WIL19848902

Name: Morgan Williams

EXAM: Electrical Principles

Code: M4X00935

Q1

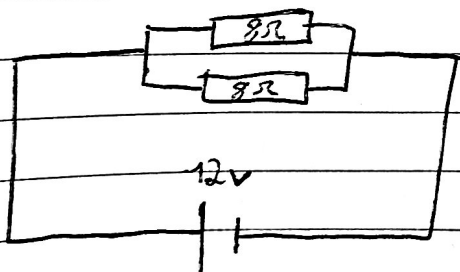


i) $3 + 5 = 8\Omega$

$$\frac{6 \times 12}{6 + 12} = 4\Omega$$

$$6 + 12$$

$$4\Omega + 4\Omega = 8\Omega$$



$$R_T = \frac{8 \times 8}{8 + 8} = \underline{4\Omega}$$

ii) current total

$$\frac{V}{R} = C$$

$$R$$

$$\frac{12}{4} = \underline{3A}$$

iii) Total Power = $\frac{V^2}{R} = \frac{12^2}{4} = \underline{36W}$

DATE: 18/05/2020

Page 2 of 4

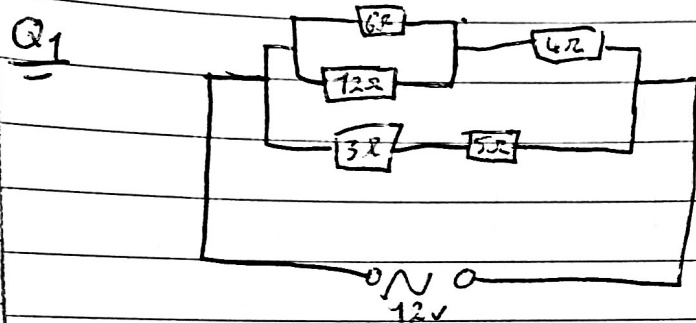
TIME: 13:00

STUDENT ID: WIL19848902

NAME: Morgan Williams

Exam: Electrical Principles

Code: M4X00935



ii)

$$I_{3\Omega} = \frac{12}{8} = 1.5A$$

~~vi) $V_{5\Omega} = 5 \times 1.5 = 7.5V$~~

~~vi) $V_{4\Omega} = 1.5 \times 4 = 6V$~~

~~vii) $I_{12\Omega} = \frac{6}{12} = 0.5A$~~

DATE: 18/05/2020

TIME: 13:00

Page 3 of 4

STUDENT I.D: WIL19848902

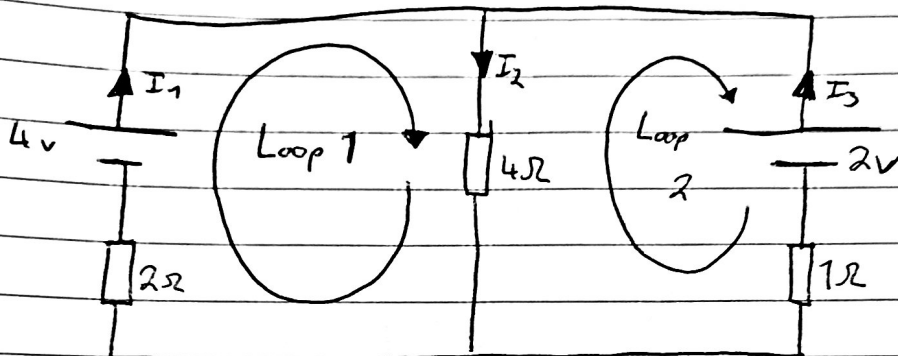
NAME: Morgan Williams

Exam: Electronic Principles

Code: M4X00935

Q1

B)



$$(1) I_1 + I_3 = I_2$$

$$(2) 4 - 4I_2 - 2I_1 = 0 \rightarrow \begin{cases} 4 - 4(I_1 + I_3) - 2I_1 = 0 \\ -2 + 1I_3 + 4(I_1 + I_3) = 0 \end{cases}$$

$$(3) -2 + 1I_3 + 4I_2 = 0$$

$$\begin{cases} 4 - 6I_1 - 4I_3 = 0 \\ -2 + 4I_1 + 5I_3 = 0 \end{cases} \begin{matrix} \times 2 \\ \times 3 \end{matrix} \leftarrow \begin{cases} 4 - 4I_1 - 4I_3 - 2I_1 = 0 \\ -2 + 1I_3 + 4I_1 + 4I_3 = 0 \end{cases}$$

$$8 - 12I_1 - 8I_3 = 0$$

$$-6 + 12I_1 + 15I_3 = 0$$

$$-12I_1 - 8I_3 = -8$$

$$12I_1 + 15I_3 = 6$$

$$7I_3 = -2$$

7

$$I_3 = -0.286 \text{ A}$$

$$12I_1 + 15(-0.286) = 6$$

$$12I_1 = 6 + 4.29$$

12

$$I_1 = 0.86 \text{ A}$$

$$I_2 = 0.86 - 0.286$$

$$I_2 = 0.574 \text{ A}$$

DATE: 18/05/2020

Page 4 of 9

TIME: 73:00

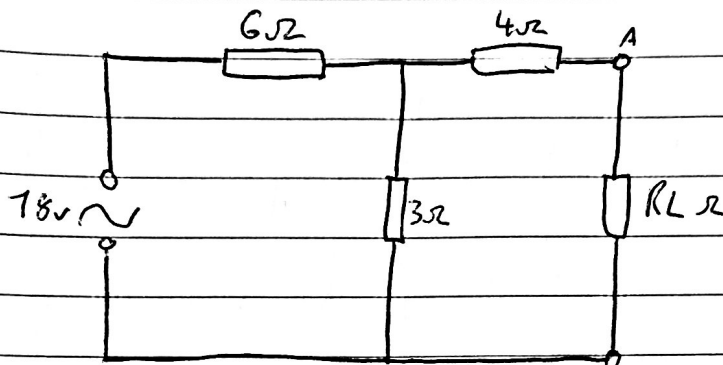
Student ID : WZL 19848902

NAME: Morgan Williams

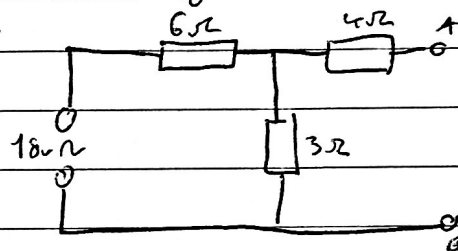
Exam: Electrical Principles

Code: M4X 00935

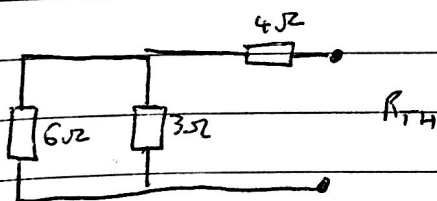
Q2.



c) 

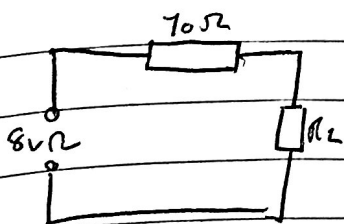


$$V_{TH} = \frac{6 \times 3}{6+3} = 2V$$

-)


$$R_{TH} = \left(\frac{6 \times 3}{6+3} \right) + 4 = 7.0 \Omega$$

iii]



$$\text{Max power} = \left(\frac{8}{10} \right) \times (10)$$

$$P = 32 \text{ W}$$

DATE: 19/05/2020

Page 5 of 6

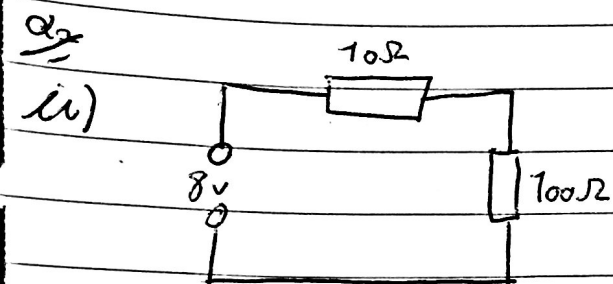
TIME: 13:00

Student ID: WIL 19848902

NAME: Morgan Williams

Exam: Electrical Principles

Code: M4X00935



$$\frac{8}{100} = 0.08A$$

100

18/05/2020
TIME: 13:00

Page 6 of 17

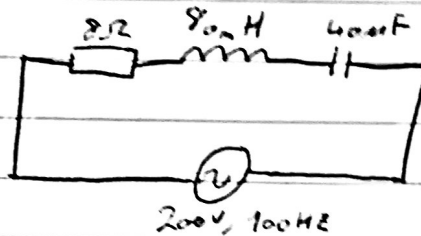
Student ID: VIL7954102

Name: Morgan Williams

Exam: Electrical Principles

Code: M4X00935

Q3



(i)

(1)

Inductive Reactance, X_L

$$X_L = 2\pi fL = 2\pi \times 100 \times 80 \times 10^{-3} \text{ H} = 50.27 \Omega$$

Capacitive Reactance, X_C

$$X_C = \frac{1}{2\pi fC} = \frac{1}{2\pi \times 100 \times 40 \times 10^{-6} \text{ F}} = 39.8 \Omega$$

Circuit impedance:

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

$$Z = \sqrt{8^2 + (50.27 - 39.8)^2}$$

$$Z = 50.88 \Omega \text{ (2.d.p.)}$$

$$\text{(ii) } I_r = \frac{200}{50.88} = 3.93 \text{ A}$$

$$\text{(iii) } 3.93 \times 50.27 = 197.56 \text{ mV}$$

$$\text{(iv) } 3.93 \times 39.8 = 156.414 \text{ V}$$

$$\text{V) } \cos \theta = \frac{R}{Z} = \frac{8}{50.88} = 0.16$$

$$\cos^{-1} 0.16 = 80.8^\circ \text{ (1.d.p.) Lagging}$$

18/05/2020
TIME: 13:00

Page 7 of 7

Student ID: WIL19848902

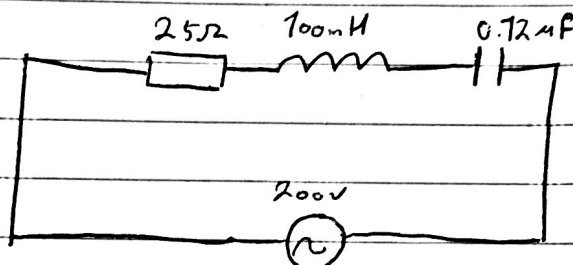
NAME: Morgan Williams

Exam: Electrical Principles

Code: M4X00935

Q3

b



i) $x_L = x_C$

$$f^2 = \frac{1}{2\pi L \times 2\pi C} = \frac{1}{4\pi^2 LC}$$

$$f = \frac{1}{4\pi^2 (100 \times 10^{-3} \times 0.12 \times 10^{-6})}$$

$$f = 1452.88 \text{ Hz}$$

$$ii) x_L = 2\pi f \times 100 \times 10^{-3} = 912.87 \Omega$$

$$iii) x_C = \frac{1}{2\pi f C} = \frac{1}{2\pi \times 1452.88 \times 0.12 \times 10^{-6}} = 912.87 \Omega$$

$$iv) I_T = \frac{200}{\sqrt{912.87^2 + 912.87^2 + 25^2}} = 0.11 \text{ A}$$

$$v) V_C = 0.11 \times 912.87 = 100.4157 \text{ V}$$

$$vi) V_L = 0.11 \times 912.87 = 100.4157 \text{ V}$$

$$vii) = \frac{1}{25} \sqrt{\frac{100 \times 10^{-3}}{0.12 \times 10^{-6}}}$$
$$Q = 11.55$$

DATE: 18/05/2020

TIME: 13:00

Page 8 of 8

Student Id: WIL 19848902

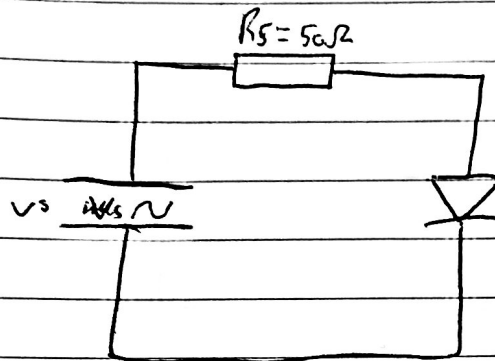
NAME: Morgan Williams

Exam: Electrical Principles

Code: M4x00935

Q4

a)



i) $5 - 0.7 = 4.3\text{V}$

$$I_{R_S} = \frac{4.3}{50} = 0.086\text{A}$$

Current through diode = 0.086A
 86mA

ii) Current Can't flow due to reverse bias

DATE: 18/05/2020

TIME: 13:00

Page 9 of 9

Student ID: WZL19848902

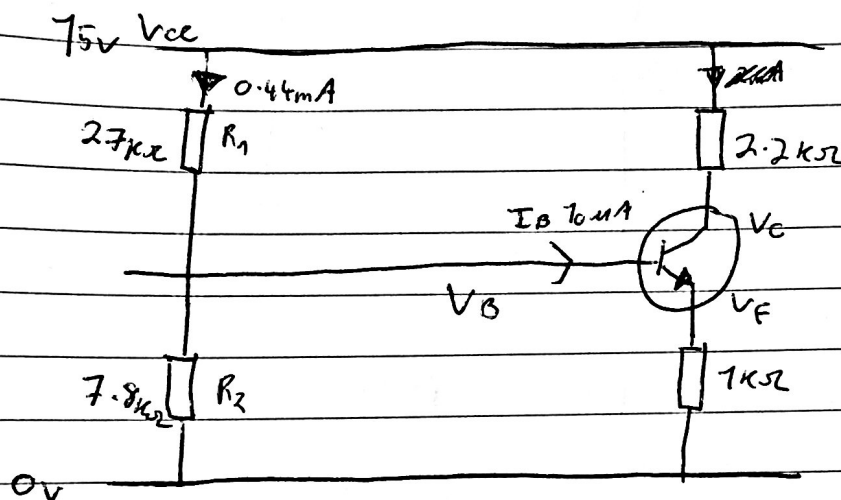
Name: Morgan Williams

Exam: Electrical Principles

Code: M4X00935

Q3

b)



~~Handwritten scribbles and crossed-out text.~~

iii) $\text{gain} = \frac{R_c}{R_E} = \frac{2,200}{1,000} = 2.2 \text{ gain}$

~~Handwritten scribbles and crossed-out equations.~~

ii) ~~Handwritten scribbles~~ $R_F = 2\text{mA}$

i) $\frac{2\text{mA}}{200} = I_B = 10\mu\text{A}$

$I_{R2} = I_B \times 10 = 100\mu\text{A}$