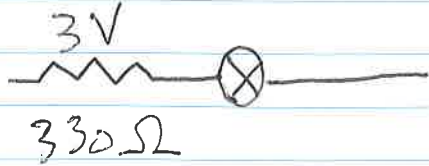



$$= \frac{3}{30} = 9.09 \times 10^{-2} \text{ A} = 9.09 \text{ mA}$$

75
12-1
75/100

Question 1

a)



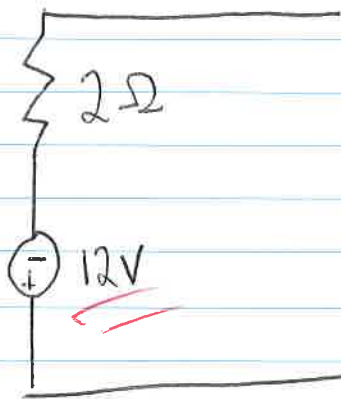
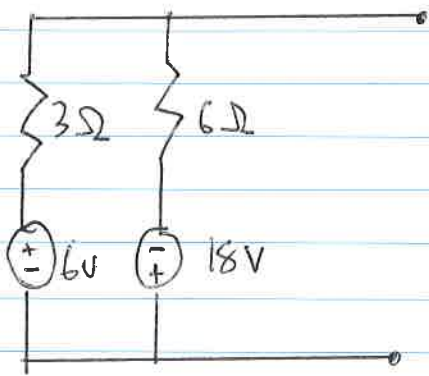
$$I = \frac{V}{R} = \frac{3}{330} = 9.09 \times 10^{-3} \text{ A} = 9.09 \text{ mA}$$

$$I = \frac{3}{270} = 0.011 \text{ A}$$

$$\Delta I = 0.011 - 9.09 \times 10^{-3} = 1.91 \text{ mA}$$

$$b) P = 1 \text{ W} \quad P = IV \quad I_{\text{max}} = \frac{P}{V} = \frac{1}{3} = 0.33 \text{ A}$$

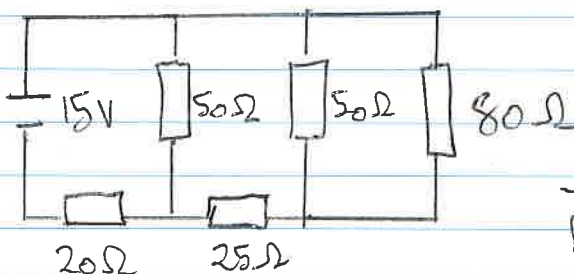
c)



$$V_2 - V_1 = 18 - 6 = 12 \text{ V}$$

$$\frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2} = \frac{1}{3} + \frac{1}{6} = \frac{1}{2} \quad R = 2 \Omega$$

d)

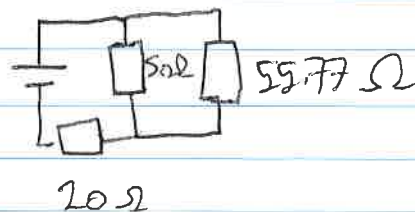
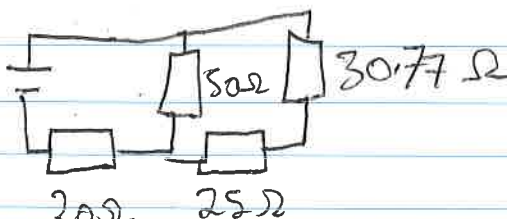


$$\frac{1}{R} = \frac{1}{R_6} + \frac{1}{R_5} + \frac{1}{R_{24}}$$

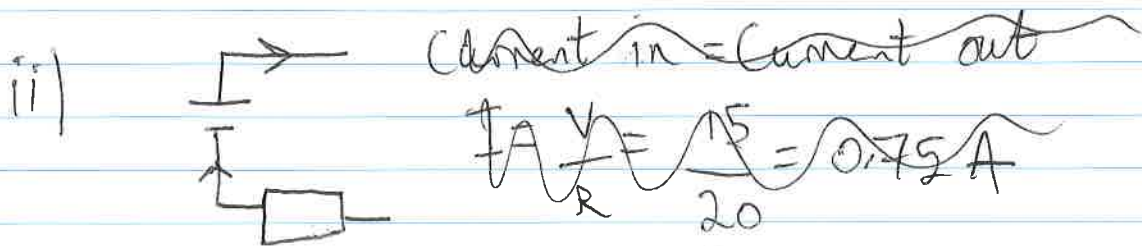
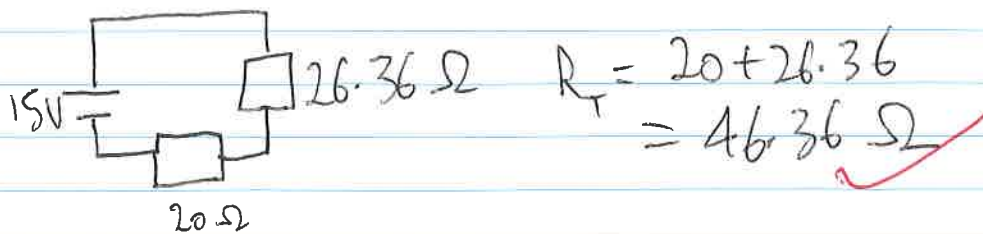
$$\frac{1}{R} = \frac{1}{50} + \frac{1}{50} + \frac{1}{80}$$

$$\frac{1}{R} = \frac{21}{400} \quad R = 19.05 \Omega$$

$$\frac{1}{R} = \frac{1}{50} + \frac{1}{80} = 0.0325 \quad R = 30.77 \Omega$$



$$\frac{1}{R} = \frac{1}{55.77} + \frac{1}{50} = 0.0379 \dots \quad R = 26.36 \Omega$$



$$V = IR_1 + IR_2 = I(46.36)$$

$$V = \frac{20}{46.36} (15) = 6.471 \quad I = \frac{V}{R} = \frac{6.471}{20} = 0.324 A$$

e) $P_{in} = 25 W$ $P_{out} = 20 W$

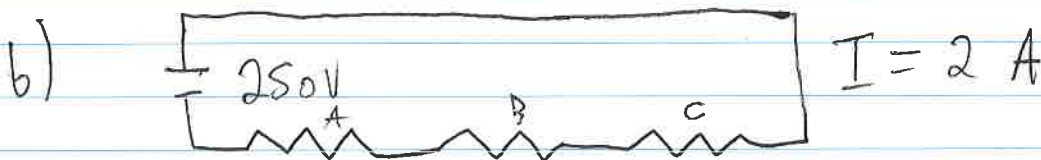
$$\% \text{ efficiency} = \frac{20}{25} (100) = 80\%$$

$$\text{total power loss} = 5 W$$

Question 2

$$V = IR$$

$$R_1 = 10 \Omega \quad R_2 = 10 \Omega \quad R_3 = 10 \Omega \quad R_4 = 10 \Omega \quad R_5 = 10 \Omega$$



f)

$$IR_A + IR_B + IR_C = 250$$

$$R_A + R_B + R_C = 125$$

$$R_A = 125 - 50 - \frac{80}{2} = 35 \Omega$$

$$V_C = 2(50) = 100 V$$

$$V_A = 250 - 80 - 100 = 70 V$$

$$\text{ii) } V = IR = 2(50) = 100 \text{ V}$$

$$\text{iii) } (R_A + R_B + R_C)I = 250$$

$$R_A + R_B + R_C = 125$$

$$R_A + 40 + 50 = 125$$

$$R_A = 35 \Omega$$

$$R_B = \frac{V}{I} = \frac{80}{2} = 40 \Omega$$

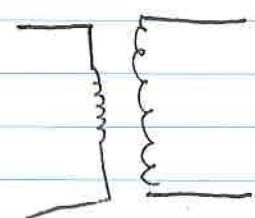
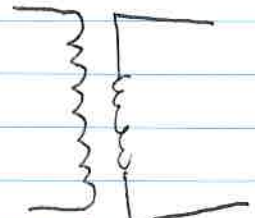
c) i) The ratio of current to voltage, the opposition to the flow of current.

ii) The total opposing force to flow of current combining resistance and reactance.

iii) The total opposition to change of direction of current flow.

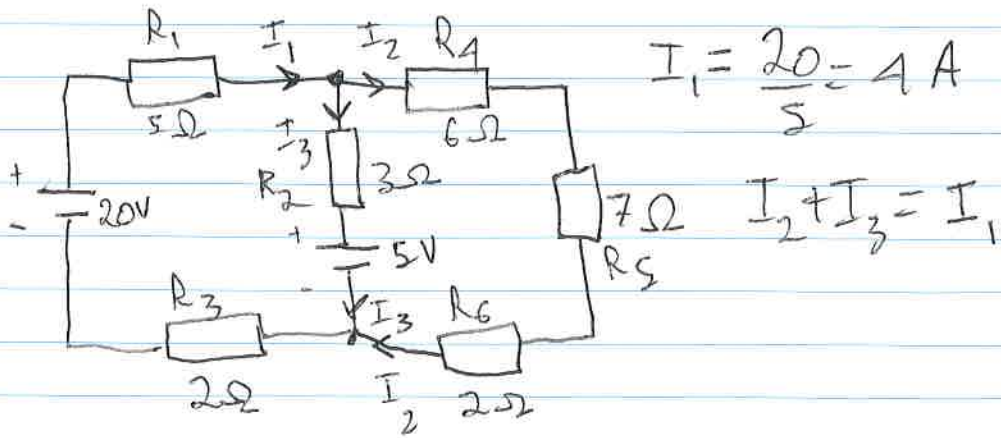
iv) The addition of impurities to a pure semiconducting material to increase its conductivity.

v) The rating of the ability for a voltage source to use all of its potential energy to induce voltage.

d)   Voltage is increased in step-up transformers. Voltage is decreased in step-down transformers.

Current is decreased in step up transformers; Current is increased in step down transformers.

Q3 a)



$$20 + 5 = 5I + 3I + 2I \quad I_3 = 2.5 \text{ A}$$

$$25 = 10I \quad I = 2.5 \text{ A}$$

$$I_2 = 4 - 2.5 = 1.5 \text{ A}$$

$$R_1 = 4 \text{ A} \quad R_3 = 4 \text{ A}$$

$$R_2 = 2.5 \text{ A} \quad R_4, R_5, R_6 = 1.5 \text{ A}$$

b) i) $X_C = \frac{1}{2\pi f C} \quad V = 10 \text{ V}$
 $f = 1.5 \times 10^3 \text{ Hz}$

$$X_C = \frac{1}{2\pi (1.5 \times 10^3) (0.022 \times 10^{-6})} = 4822.9 \text{ } \Omega$$

ii) $Z = \sqrt{X_R^2 + X_C^2} = \sqrt{(2.2 \times 10^3)^2 + (4822.9)^2}$

$$Z = 5300.98 \text{ } \Omega$$

iii) $I = \frac{V}{Z} = \frac{10}{5300.98} = 1.886 \times 10^{-3} \text{ A}$

Q3 = 12
 12

Q4. $i = 40 \sin(314t)$

i) $I_{\max} \Rightarrow \sin(314t) = 1 \therefore i_{\max} = 40 \text{ A}$

ii) $I_{\text{rms}} = \frac{I_m}{\sqrt{2}} \quad \omega = 314$
 $= \frac{40}{\sqrt{2}} = 28.28 \text{ A}$

iii) $2\pi f = 314 \quad f = \frac{314}{2\pi} = 49.97 \text{ Hz}$

b) P-type



trivalent doping impurities

N-type



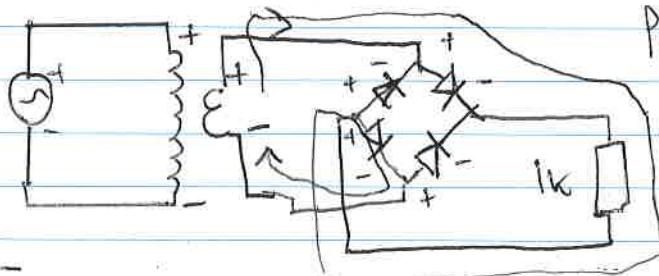
pentavalent doping impurities

P-type - more Positive ions Concentration than negative electrons

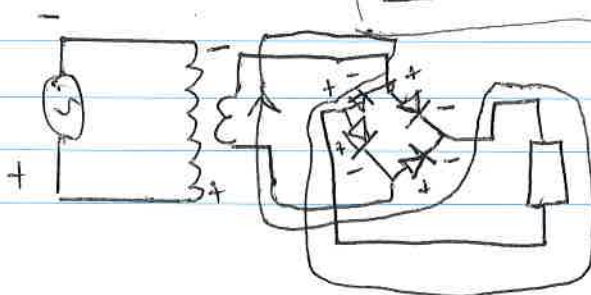
N-type - more negative particles concentrated than positive particles.

c) ~~Bridge~~ transistor, PNP transistor, NPN transistor

d) AC current applied to step down transformer



Positive Waves able to travel through complete circuit.



Negative Waves able to travel through complete circuit.

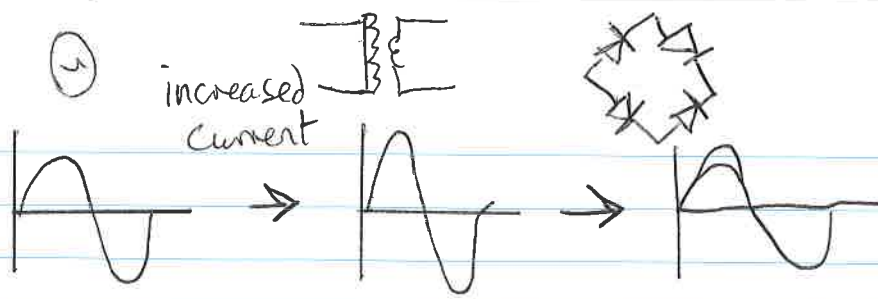
2

2

2

4

2



Positive and Negative Waveforms Conserved. ✓

The circuit in fig 6 is used when positive and negative flows of current need to be conserved.

4+2

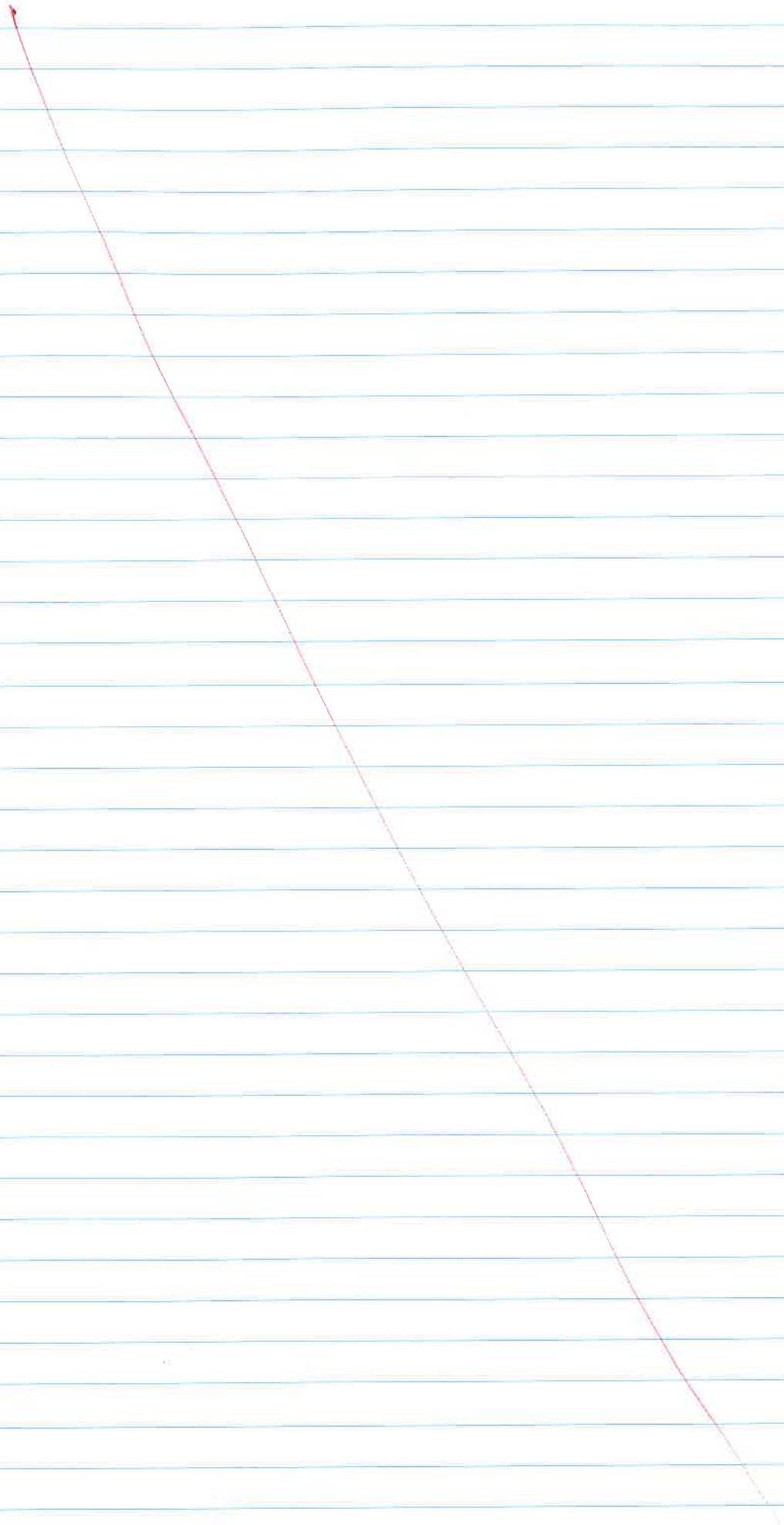
Q4 = 15+

(1+)



Question No.

Examiner Only



Arholwr yn unig

Rhif y Cwestiwn