Electronics for Biology Students
PCU1170 - 2009/2010
Department of Physics - OUSL
Model Answers - Assignment

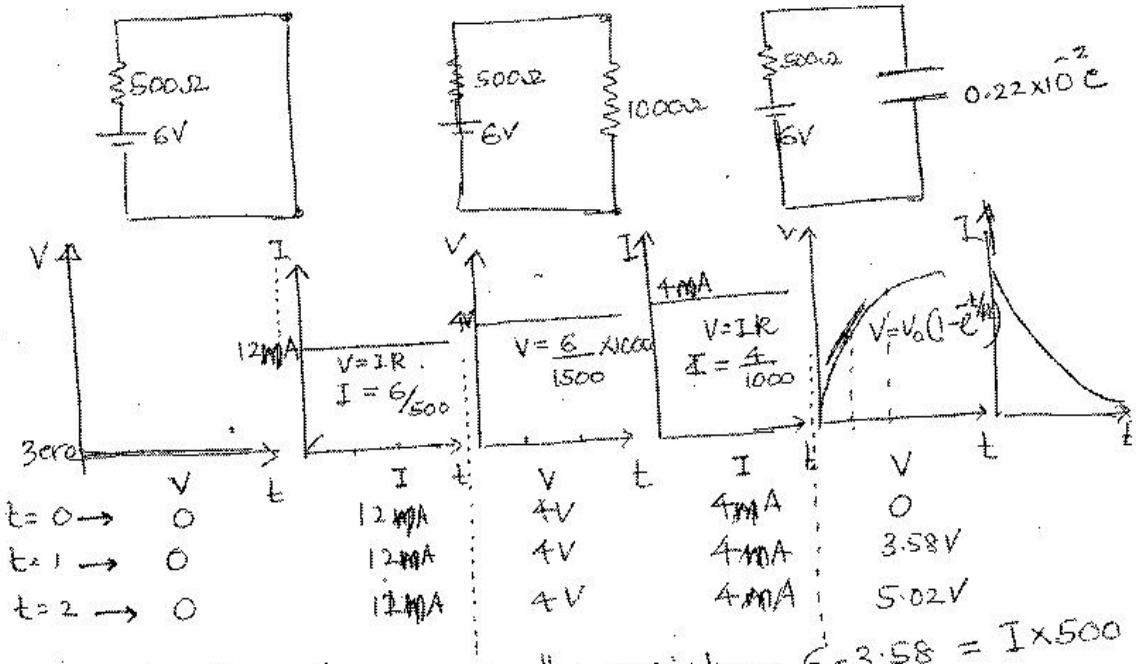
1) (a)

(i) $1200 \pm 10\%\ \Omega$ (ii) $11000 \pm 10\%\ \Omega$ (iii) $46 \times 10^5\ \Omega \pm ?$

$R_{min} = 1080\ \Omega$ $R_{min} = 9.9\ k\Omega$ $4.6\ M\Omega$

$R_{max} = 1320\ \Omega$ $R_{max} = 12.1\ k\Omega$

(b) Conductor



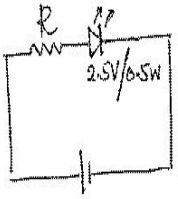
When $t = 1s$, voltage across the resistor $= 6 - 3.58 = I \times 500$

$\therefore I_{t=1} = 4.84\ mA$.

$I_{t=2} = 1.96\ mA$.

$I_{t=\infty} = 12\ mA$ //

(2)

(a) 

Maximum Current through the LED = I_{max}.

$W = VI_{max}$.

$0.5 = 2.5 \times I_{max} \Rightarrow I_{max} = 200\,mA$.

Then $V = IR$ for R.

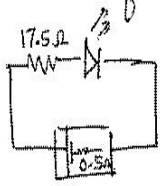
$6 - 2.5 = 200\times10^{-3} \times R \Rightarrow R = 17.5\,\Omega$

(b) Energy dissipated in 2 minutes $= Wt = 0.5 \times 2 \times 60$

$= 60\,J$ //

(c) $Q = it = 0.2 \times (2\times60) = 24\,C$.

Number of electrons $= \frac{Q}{e} = \frac{24\,C}{1.6\times10^{-19}\,C} = 1.5\times10^{20}$ //

(d) 

The current through the LED

$I = \frac{V}{R} = \frac{6-2.5}{17.5+0.5}$

$= 0.194\,A$

Power dissipated by the Resistor $= I^2 \times R = (0.194)^2 \times 17.5$

$= 0.659\,W$ //

Power dissipated by the LED $= V \times I = 2.5 \times 0.194$

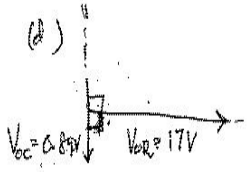
$= 0.485\,W$

(3) (a) $R = 1.7\,k\Omega$ // $X_C = \frac{1}{\omega C} = \frac{1}{75\times150\times10^{-6}} \approx 89\,\Omega$ //

(b) $V_R = I_0 R = 10\times10^{-3} \times 1.7\times10^{3}$ $V_{oc} = I_0 \times X_C = 10\times10^{-3}\times89$

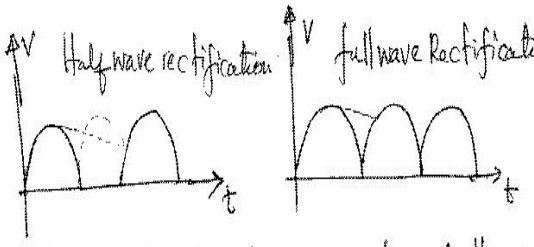
$= 17\,V$ // $= 0.89\,V$ //

(c) $Z = \sqrt{R^2 + \left(\frac{1}{\omega C}\right)^2} \approx 1.7\,k\Omega$

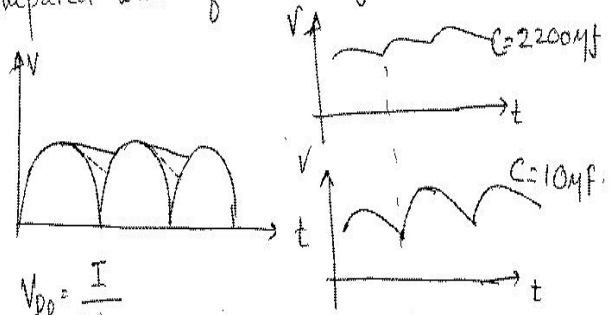
(d) 

(e) The two voltage Components are out of phase (90°)

(4) Refer the text book.

(5) (a) 

With the Similar Smoothing Capacitor, full wave rectifier circuit produces lower ripple voltage. Compared to the halfwave rectifier circuit.

(b) 

$V_{pp} = \frac{I}{2fC}$

$V_{pp(10)} = \frac{I}{2f\times10}$ $V_{pp(2200)} = \frac{I}{2f\times2200}$.

$\frac{V_{pp(2200)}}{V_{pp(10)}} = \frac{1}{220}$ // $V_{pp(2200)} : V_{pp(10)} = 1:220$

(c) Refer the book (Page 7-14).

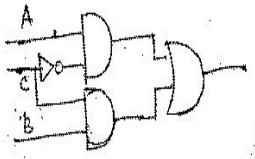
(6)

Inputs			Out Put	
A	B	C	Z	
0	0	0	0	
0	0	1	0	
0	1	0	0	
0	1	1	1	$\rightarrow \bar{A}\cdot B\cdot C$
1	0	0	1	$\rightarrow A\cdot\bar{B}\cdot\bar{C}$
1	0	1	0	
1	1	0	1	$\rightarrow A\cdot B\cdot\bar{C}$
1	1	1	1	$\rightarrow A\cdot B\cdot C$

(a) $Z = \bar{A}\cdot B\cdot C + A\cdot\bar{B}\cdot\bar{C} + A\cdot B\cdot\bar{C} + A\cdot B\cdot C$

$= A\bar{C}(\bar{B}+B) + BC(\bar{A}+A)$

$= A\bar{C} + BC$



(b) (i), (ii), & (iii)

Refer the text book.