Unit 2 Practice NAB solutions.

1. $E = QV$ ($\frac{1}{2}$)

$= (1 \times 10^{-5}) \times 600$ ($\frac{1}{2}$)

$= \underline{6 \times 10^{-3}\,J}$ ($\frac{1}{2}$ value, $\frac{1}{2}$ unit)

2. (a)(i) $E = I(R+r)$ ($\frac{1}{2}$)

$6 = I(22+2)$ ($\frac{1}{2}$)

$I = \frac{6}{24} = \underline{0{\cdot}25\,A.}$ ($\frac{1}{2}$value, $\frac{1}{2}$ unit)

(ii) $V = IR$ ($\frac{1}{2}$)

$= 0{\cdot}25 \times 22$ ($\frac{1}{2}$)

$= \underline{5{\cdot}5\,V.}$ ($\frac{1}{2}$ value, $\frac{1}{2}$ unit)

(iii) lost volts $= Ir$

$= 0{\cdot}25 \times 2$

$= \underline{0{\cdot}5\,V}$ (1)

(b) total resistance has decreased

current will increase ($\frac{1}{2}$)

lost volts $= Ir$ ($\frac{1}{2}$)

r is constant ($\frac{1}{2}$)

lost volts will increase. ($\frac{1}{2}$)

3. (a) $T = 2 \times 2 = 4\,\mu s = 0.004s$ $(\frac{1}{2})$

$f = \frac{1}{T}$ $(\frac{1}{2})$ $= \frac{1}{0.004} = \underline{250Hz}$ ($\frac{1}{2}$ value, $\frac{1}{2}$ unit)

(b) $V_{peak} = \sqrt{2}\, V_{RMS}$ $(\frac{1}{2})$

$V_{peak} = \sqrt{2} \times 12$ $(\frac{1}{2})$

$V_{peak} = \underline{17V.}$ ($\frac{1}{2}$ value, $\frac{1}{2}$ unit)

4. (a) $I = \frac{V_S}{R}$ $(\frac{1}{2})$

$= \frac{9}{100}$ $(\frac{1}{2})$

$= \underline{0.09A.}$ ($\frac{1}{2}$ value, $\frac{1}{2}$ unit)

(b) $V_S = V_R + V_C$

$9 = 6 + V_C$

$V_C = 9 - 6 = \underline{3V.}$ (1)

(c) (i) $Q = CV$ $(\frac{1}{2})$

$= (2200 \times 10^{-6}) \times 9$ $(\frac{1}{2})$

$= \underline{19.8\,mC}$ $(0.0198C)$

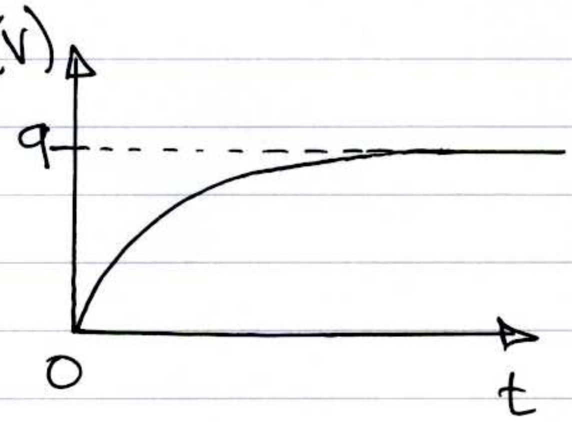
($\frac{1}{2}$ value, $\frac{1}{2}$ unit)

4\. (c) (ii) $E = \frac{1}{2}CV^2$ ($\frac{1}{2}$)

$= \frac{1}{2} \times (2200 \times 10^{-6}) \times 9^2$ ($\frac{1}{2}$)

$= \underline{89.1\,mJ}$ ($\frac{1}{2}$ value, $\frac{1}{2}$ unit)

5\. (a)



($\frac{1}{2}$ shape, $\frac{1}{2}$ y-axis values)

(b) It will take less time (1) for the capacitor to charge.

6\. $V_o = \frac{R_f}{R_1}(V_2 - V_1)$ ($\frac{1}{2}$)

$V_o = \frac{100}{5}(0.5 - 0.4)$ ($\frac{1}{2}$)

$V_o = 20 \times 0.1$

$\underline{V_o = 2V.}$ ($\frac{1}{2}$ value, $\frac{1}{2}$ unit)

7\. (a) inverting mode. (1)

(b) (i) $\text{gain} = -\frac{V_{out}}{V_{in}}$ ($\frac{1}{2}$)

$= -\frac{-6}{0.2}$ ($\frac{1}{2}$)

$= \underline{30.}$ (1) ($-\frac{1}{2}$ if unit given)

7. (b) (ii) $\text{gain} = \frac{R_f}{R_1}$ ($\frac{1}{2}$)

$$30 = \frac{R_f}{R_1} \quad (\tfrac{1}{2})$$

$$R_f = 30 \times R_1$$
$$= 30 \times 10\,k\Omega$$
$$= 300\,k\Omega.$$ ($\frac{1}{2}$ value, $\frac{1}{2}$ unit)

(iii) The output voltage from the op amp cannot exceed the ±15V provided by the power supply. (1)