

"I have adhered to the Duke Community Standard in completing this assignment"

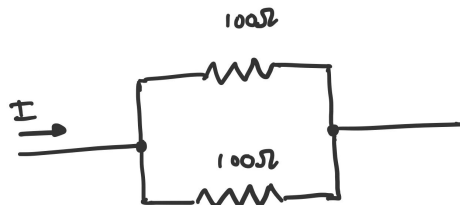
Pre-Lab Deliverable (1)

- (a) $V_s = 8V$
- (b) $V_{out} = 4V$
- (c) $V_s = 8V$
- (d) $V_{out} = 2V$

Pre-Lab Deliverable (2)

Resistor	1st	2nd	3rd	4th
43 Ω	Yello	Orange	Black	Gold
100 Ω	Brown	Black	Brown	Gold
220 Ω	Red	Red	Brown	Gold
470 Ω	Yellow	Violet	Brown	Gold
1 k Ω	Brown	Black	Red	Gold
2 k Ω	Red	Black	Red	Gold
4.7 k Ω	Yellow	Violet	Red	Gold
10 k Ω	Brown	Black	Orange	Gold

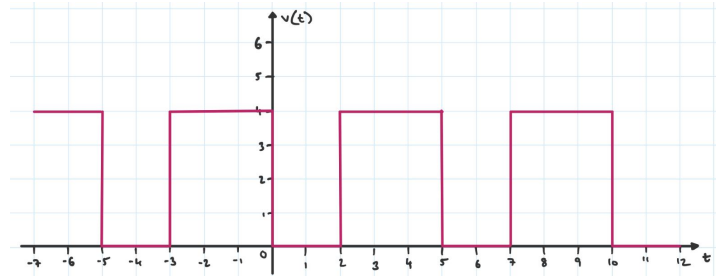
Pre-Lab Deliverable (3)



$$\frac{1}{R_{eq}} = \frac{1}{100} + \frac{1}{100} = \frac{1}{50}$$

$$\Rightarrow R_{eq} = 50 \Omega$$

Pre-Lab Deliverable (4)



$$\text{Time Period} = 5 - 0 = 5$$

$$\text{Fundamental Frequency} = \frac{1}{5} = 0.2$$

$$\text{Fundamental angular frequency} = \frac{2\pi}{5} = 0.4\pi$$

$$\text{Maximum} = 4$$

$$\text{Minimum} = 0$$

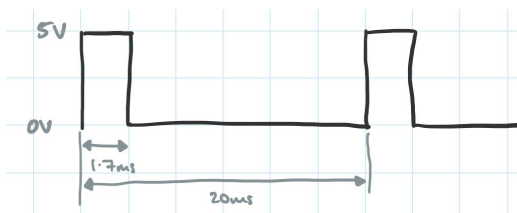
$$\text{Average} = \frac{1}{5} \int_0^5 v(t) dt = \frac{1}{5} (3 \times 4) = \frac{12}{5} = 2.4$$

$$\text{Peak-to-peak} = 4 - 0 = 4$$

$$\text{RMS} = \sqrt{\frac{1}{T} \int_0^T (v(t))^2 dt} = \sqrt{\frac{1}{5} (3 \times 4^2)} = \sqrt{\frac{1}{5} \times 48} = 4 \sqrt{\frac{3}{5}}$$

$$\text{RMS}_{AC} = \sqrt{\frac{1}{T} \int_0^T (v(t) - \bar{v})^2 dt} = \sqrt{\frac{1}{5} \times ((4 - 2.4)^2 \times 3 + (-2.4)^2 \times 2)} = \sqrt{\frac{96}{25}} = \frac{4}{5} \sqrt{6}$$

Pre-Lab Deliverable (5)



$$\text{Period} = 20\text{ms}$$

$$\text{Frequency} = \frac{1}{20} \text{ ms}^{-1}$$

$$\text{Angular freq.} = \frac{2\pi}{20} \text{ rad ms}^{-1}$$

$$\text{Maximum} = 5\text{V}$$

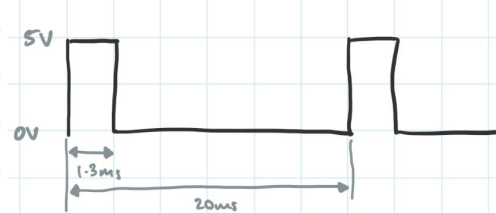
$$\text{minimum} = 0\text{V}$$

$$\text{Peak-to-peak} = 5\text{V}$$

$$\text{Average} = \frac{1}{T} \int_0^T v(t) dt = \frac{1}{20} \times (5 \times 1.7) = 0.425\text{V}$$

$$\text{RMS} = \sqrt{\frac{1}{T} \int_0^T (v(t))^2 dt} = \sqrt{\frac{1}{20} (25 \times 1.7)} = \sqrt{\frac{17}{8}} = \sqrt{2.125}\text{V}$$

$$\text{RMS}_{AC} = \sqrt{\frac{1}{T} \int_0^T (v(t) - \bar{v})^2 dt} = \sqrt{\frac{1}{20} ((5 - 0.425)^2 \times 1.7 + (-0.425)^2 \times 18.3)} = 1.394\text{V}$$



$$\text{Period} = 20\text{ms}$$

$$\text{Frequency} = \frac{1}{20} \text{ ms}^{-1}$$

$$\text{Angular freq.} = \frac{2\pi}{20} \text{ rad ms}^{-1}$$

$$\text{Maximum} = 5\text{V}$$

$$\text{minimum} = 0\text{V}$$

$$\text{Peak-to-peak} = 5\text{V}$$

$$\text{Average} = \frac{1}{T} \int_0^T v(t) dt = \frac{1}{20} \times (5 \times 1.3) = 0.325\text{V}$$

$$\text{RMS} = \sqrt{\frac{1}{T} \int_0^T (v(t))^2 dt} = \sqrt{\frac{1}{20} (25 \times 1.3)} = \sqrt{1.275}\text{V}$$

$$\text{RMS}_{AC} = \sqrt{\frac{1}{T} \int_0^T (v(t) - \bar{v})^2 dt} = \sqrt{\frac{1}{20} ((5 - 0.325)^2 \times 1.3 + (-0.325)^2 \times 18.7)} = 1.253\text{V}$$