

Homework Assignment #1 – Circuit Variables

Reading Assignment:

Chapter 1 in Electric Circuits, 8th Edition, by Nilsson

Problem Assignment:

- 1) Chapter 1 # 9, 11, 12, 15, 16, 17, 19, 20, 22, 28, 30
- 2) Using the power rating values from Table 1 (or from the Lecture #2 notes), calculate the following if the cost of electricity is \$0.08/kW·h:
 - A) The cost to run an air conditioner 12 h/day for 30 days
 - B) The cost to watch a television for 4 h/day for 1 year
 - C) The cost to dry your hair with a blow dryer (10 minutes)

Notes:

- 1) On problem 1.16, begin by drawing a graph of the voltage $v(t)$ and finding an equation for $v(t)$ in the form $y = mx + b$. Then find $p(t) = v(t)i(t)$ and integrate $p(t)$ to find energy.
- 2) Be sure to follow the required **PROBLEM FORMAT** for every assignment in this course as specified below.

PROBLEM FORMAT:

- Write out **all** given information with the problem, including problem statements, circuits, sketches, etc.,
- Box your final answers
- Include 3 significant digits with all non-integer answers
- Present you work neatly
- Work all problems in pencil (so that you can erase errors)
- Include units with your final answers when appropriate
- Use correct mathematical notation in your solutions

Selected Answers:

(Note: Answers have also been provided for many problems that were not assigned. A good way to study for a test is to work extra problems.)

1.8) 2.18×10^{14} electrons/s

1.11) $W = 16.2$ kJ

1.15) a) Car A has the dead battery b) $W = 21.6$ kJ

1.16) $W = 43.2$ kJ

1.18) a) $P(10 \text{ ms}) = 223.79$ W b) $W = 4$ J

1.19) a) $p(t) = 2.5t \mu\text{W}$ $0 \text{ s} \leq t \leq 4 \text{ s}$
 $p(t) = 0$ $4 \text{ s} \leq t \leq 8 \text{ s}$
 $p(t) = 2.5t - 30 \mu\text{W}$ $8 \text{ s} \leq t \leq 16 \text{ s}$
etc.

b) $w(4) = 20 \mu\text{J}$, $w(12) = 0$, $w(36) = 7.2 \mu\text{J}$, $w(50) = 0$

1.20) a) 937.5 mW b) 1.875 mJ

1.28) $\Sigma P_{\text{abs}} = 21 + 9.6 + 24 = 54.6$ mW, $\Sigma P_{\text{del}} = 9 + 11 + 7 + 10.8 + 4.8 + 12 = 54.6$ mW

1.30) $\Sigma P_{\text{abs}} = 7.5 + 1 + 8.75 + 2 = 19.25$ uW, $\Sigma P_{\text{del}} = 3 + 7 + 8.75 + 0.5 = 19.25$ uW

1.22) a) $Q = 123,000 \text{ C}$ b) $w = 1247.2 \text{ kJ}$

1.29) $P_{\text{del}} = 128 + 156 + 24 + 72 + 64 = 444 \text{ mW}$, $P_{\text{abs}} = 210 + 54 + 108 + 72 = 444 \text{ mW}$

2A) \$24.77

2B) \$17.52

2C) \$0.017

Table 1: Power ratings for common appliances

| Appliance | Power Rating (W) |
|-----------------------|-------------------------|
| Air conditioner | 860 |
| Blow dryer | 1300 |
| Clock | 2 |
| Dishwasher | 1200 |
| Electric Dryer | 4800 |
| Microwave Oven | 800 |
| Television | 150 |
| Electric Water Heater | 2500 |