Date	Topic / Description
Hue D. Mai Engr 65 H.W 1 9.4.22	Problem 1

a. If charge flow is expressed as $q(t) = (14t^2 + 8t - 2)C$, determine the current flow

↳ recall that $i \triangleq dq/dt$; $q = 14t^2 + 8t - 2)C$

↳ $i = \frac{d}{dt}[14t^2 + 8t - 2) = 28t + 8$ ✓

b. Charge flow is expressed as $q(t) = (11e^{-t} - 21e^{-2t})nC$

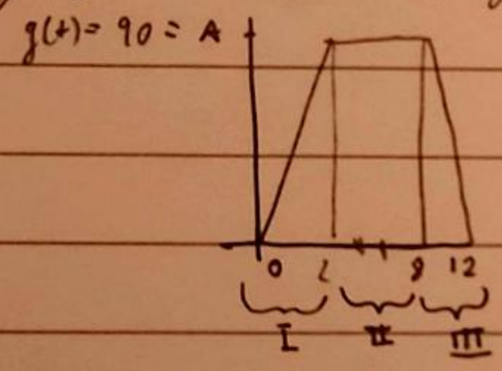
↳ $i \triangleq dq/dt$; $q = 11e^{-t} - 21e^{-2t}$

↳ $i = \frac{d}{dt}(11e^{-t}) - \frac{d}{dt}(21e^{-2t})$

↳ $-11e^{-t} - (-42e^{-2t})$

↳ $-11e^{-t} + 42e^{-2t} = i$ ✓

c. Given the charge entering the terminal of elements demonstrated by picture below, given $A = 90$, find the current at 1ms, 6ms, 10ms



I. ↳ $[0, 2]$, Consider positive relationship

↳ $\frac{90-0}{2-0} = 45\ mC/ms$

↳ $45\ C/s$; $q(t) = 45tC$

↳ Consider current ($I = dq/dt$); $I = \frac{d(45t)}{dt} = 45$

↳ Thus, at 1ms there is $45A$ ✓

II. ↳ $[2, 8]$, Consider that this interval is constant; thereby, no changes.

↳ $I \triangleq dq/dt = \frac{d(90)}{dt} = 0$

↳ Thereby, at 6ms, there is $0A$ ✓

III ↳ $[8, 12]$, Consider decline relationship, find slope.

↳ $\frac{0-90}{12-8} = -\frac{90}{4} = -22.5C$

↳ Consider ; $q(t) = -22.5t(C)$

↳ recall that $I \triangleq dq/dt$; $I = \frac{d(-22.5t)}{dt} = -22.5A$

↳ Thus, at 10ms, there is $-22.5A$

Problem 2

a. 1 kW toaster takes 6 min to heat up 1 slice of bread. Find cost of toaster usage if it is used twice per day for 2 weeks. Consider energy cost 7 cents / kWh

↳ $\frac{6\,min}{60} \cdot 2 \cdot 14 \left(\frac{.9¢}{1\,kWh}\right)$

↳ (2.8)9 = 25.2 cent

b. How much energy does a 7-hp motor deliver in 30 min

↳ Consider desired answer is energy which is measured in Joules; Also, consider 1W = 1 J/sec

↳ Given that 1hp = 746 W

↳ 7hp → Watts → Joules / sec

↳ 7 · 746 (30 min · 60 sec) // Consider also $E = P(t)$

↳ 939600 = 9.399600 · 10^6 Joules

c. Graph depicts energy drawn by a plant from 8:00 A.M to 8:30 A.M. Calculate the total energy is much consumed by plant.

↳ Consider that $P = E(t)$

↳ from 8:00-:05 = 5(5), 8:05-:10 = 4(5), 8:10-:15 = 3(5), 8:15-:20 = 8(5)

8:20-:25 = 5(5), 8:25-:30 = 5(5)

↳ 5(5) + 4(5) + 3(5) + 8(5) + 5(5) + 0

↳ $^{140}/_{60}$ = 2.33 MJ

Problem 3

. Given that i entering positive terminal is $i(t) = 13e^{-2t}$ mA and the voltage across the device is $v(t) = 6\ di/dt$ V

a. Calculate the power absorb by the device

↳ Consider the fact that $p(t) = v(t)i(t)$

↳ Given $v(t) = 6\ di/dt$ v ; $i(t) = 13e^{-2t}$ mA

↳ $6\left(\frac{di}{dt}(13e^{-2t} \cdot 10^{-3})\right)(13e^{-2t} \cdot 10^{-3})$

$6 \cdot 13 \cdot 13 \cdot 10^{-6} \cdot e^{-2t} \cdot \frac{d}{dt}(e^{-2t})$

↳ $(1.014 \cdot 10^{-3} \cdot e^{-2t})\ 2t\, e^{-2t}$

↳ $-2.028 \cdot 10^{-3} \cdot e^{-4t}$

↳ $-2.028 \cdot e^{-4t}$ mW

b. Calculate energy absorbed in 3 seconds

·Consider $\mathcal{E} = \int_{t_0}^{t_\mathcal{E}} p\,dt$, ↳ consider $-2.028 \cdot e^{-4t}$; $t = 3 \Rightarrow \int_0^3 (-2.028 \cdot 10^{-3} e^{-4t})\,dt = -5.00 \cdot 10^{-4}$ J ✓

↳ $-2.028 \cdot 10^{-3}\left[-\frac{1}{4}e^{-4t}\right]_0^3$

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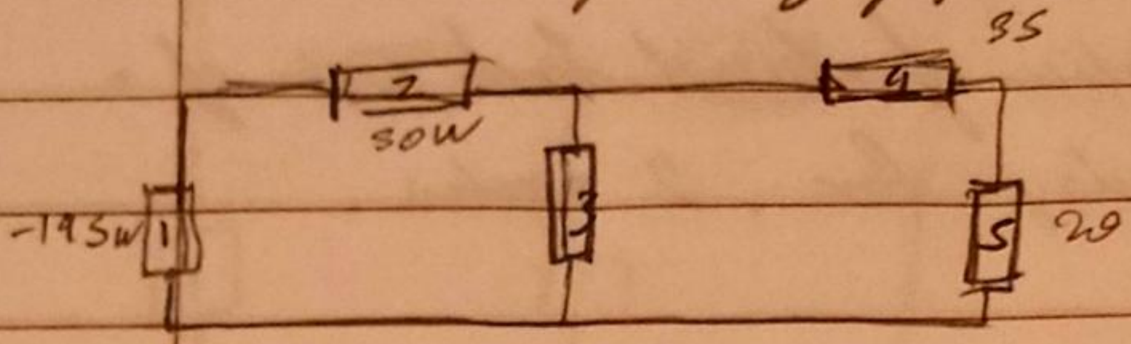
4. Consider the following figure,



- Consider, Circuit - $P_1 = -195W$

$P_2 = 50W$

$P_4 = 35W$

$P_5 = 20W$

a. Calculate P_3 = Total of $P = 0$

↳ Consider $-195 + 50 + 35 + 20 + P_3 = 0$

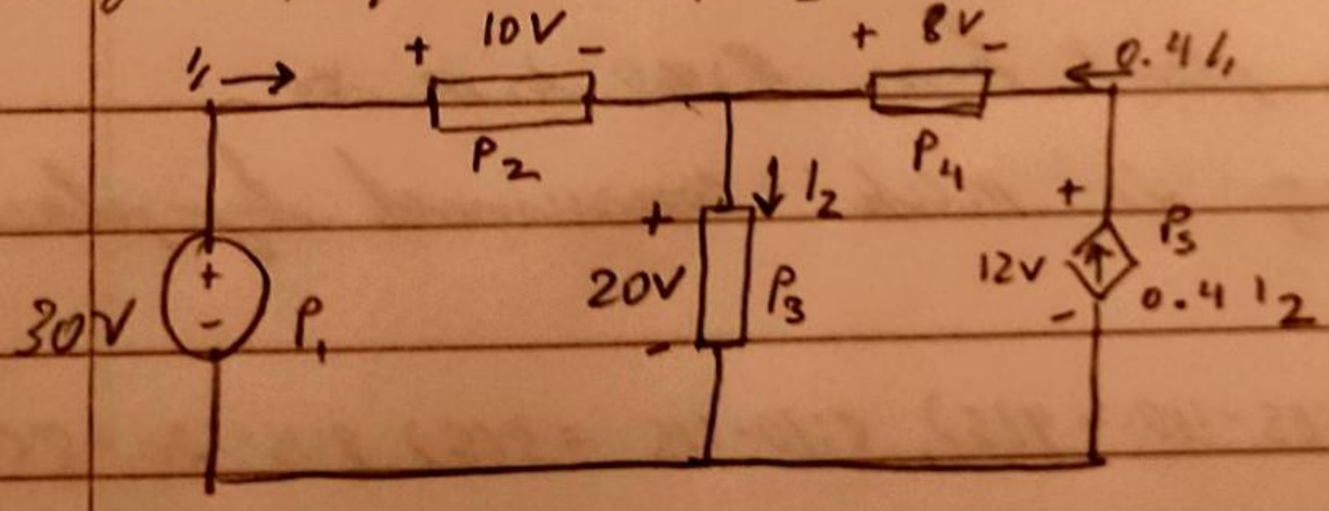
↳ $-90 + P_3 = 0$

↳ $(-90 = -P_3) -1$

↳ $P_3 = 90W$

b. Find the power absorbed by elements in given fig.

given, $I_1 = 13.00A$, $I_2 = 18.20A$



Consider $P = VI$

↳ Thereby, $P_1 = 13A(30V)$ - Negative I $= -390W$

$P_2 = 13A(10V)$ - Positive I $= 130W$

$P_3 = 18.20A(20V)$ Positive I $= 364W$

$P_4 = -.4(13.00A)(8V)$ - Negative I $= -41.6W$

$P_5 = -0.4(13.00A)(12V)$ - Negative I $= -62.4W$