ENGR 210 Spring '05 HW #1 Solutions.

1-2

(a) 22 mV (d) 0.752 MJ or 752 kJ

(b) 23 nF (e) 235 μH or 0.235 mH

(c) 56 kΩ

1-24

$v(t) = 5\cos(10t)$

$i(t) = 0.5\sin(10t)$

$p = ?$ $t = 0.2s$, $0.4s$

$$P = IV = 5\cos(10t)\,0.5\sin(10t) = 2.5\cos(10t)\sin(10t) = 1.25\sin(20t)$$

$P(t=0.2s) = -0.95W$ delivering

$P(t=0.4s) = 1.24W$ absorbing

1-28 (a) $eff = \frac{A\text{-}hr_{out}}{A\text{-}hr_{in}} = \frac{400\ A\text{-}hr}{(75A)(6hr)} = 88.9\%$

(b) $E = \int P\,dt = Pt = IVt = (75A)(24V)(6hr)\left(\frac{60s}{1min}\right)\left(\frac{60min}{1hr}\right)$

$E = 38.88\,MJ$

$1A = 1\frac{C}{s}$ $1V = 1\frac{J}{C}$

2-5 Assume Linear $m = \frac{rise}{run} = \frac{7.5 - -4}{15 - -8} = \frac{11.5}{23} = \frac{1}{2}$

$i - 7.5 = \frac{1}{2}(v - 15)$

$i = \frac{1}{2}v$

check for assumption

$i = 7.5mA$ $v = 15V$ ✓

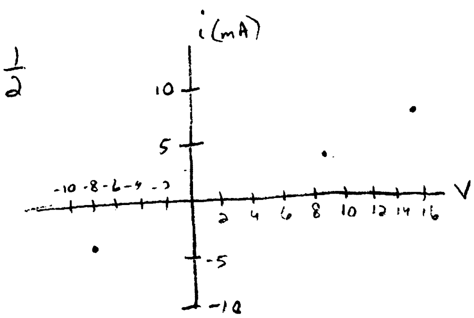
$i = 4.3mA$ $v = 8.6V$ ✓

$i = -4mA$ $v = -8V$ ✓

if $v = -15V$

$i = -7.5mA$

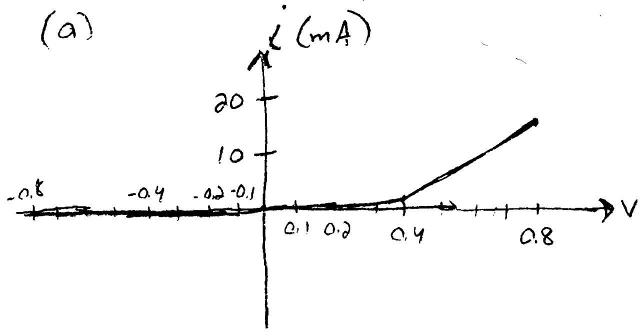
Yes. It's Linear



2-9 $i = 2\times10^{-16}(e^{40v} - 1)$

v (V)	i (A)	p = iv (W)
0	0	0
0.1	1.07×10^{-14}	1.07×10^{-13}
-0.1	-2×10^{-16}	2×10^{-15}
0.2	6×10^{-13}	1.2×10^{-13}
-0.2	-2×10^{-16}	4×10^{-17}
0.4	1.8×10^{-9}	7.2×10^{-10}
-0.4	2×10^{-16}	8×10^{-17}
0.8	16×10^{-3}	12.8×10^{-3}
-0.8	2×10^{-16}	1.6×10^{-16}

(a)



(b) nonlinear
nonbilateral
passive

(c) $v = 5V$ $i = 1.45\times10^{71}$ A $p = 7.25\times10^{71}$ W
These are HUGE!!!
Model has broken down.

(d) $v = -5V$ $i = -2\times10^{-16}$ A $p = 1\times10^{-15}$ W
These are close to zero and reasonable for a reverse-biased diode.
Model still applies