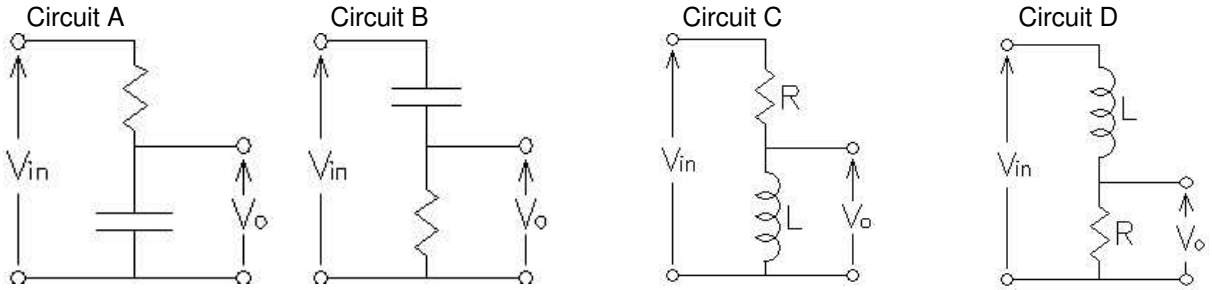
EE1050 Exam 3 given: Fall 2000

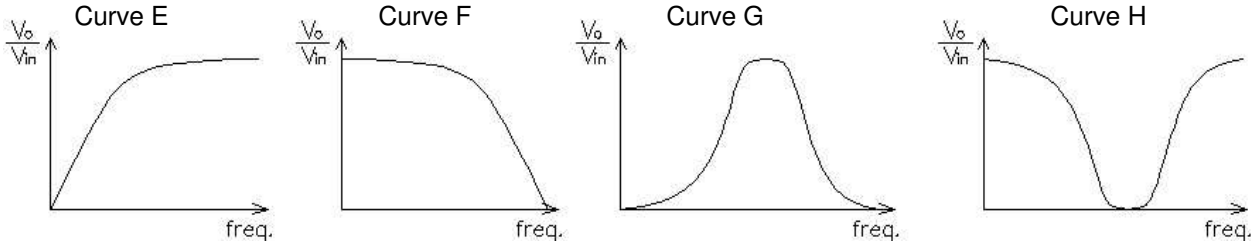
(The space between problems has been removed.)

1. (24 pts) Filters



Which frequency response curve below goes with each of the circuits above. Indicate your answer with a letter (E, F, G, or H). Note: answers may be used more than once.

Circuit A _____ Circuit B _____ Circuit C _____ Circuit D _____



Which names below go with which frequency response curves above. Indicate your answer with a letter (I, J, K, or L). Note: answers may be used more than once.

Curve E _____ Curve F _____ Curve G _____ Curve H _____

I) band pass J) band rejection K) low pass L) high pass

Which corner frequency expression below goes with each of the circuits above (top of page). Indicate your answer with a letter (M, N, O, P, Q, or R). Note: answers may be used more than once.

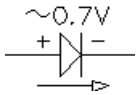
Circuit A _____ Circuit B _____ Circuit C _____ Circuit D _____

M) $f_c = \frac{R}{2\cdot\pi\cdot C}$ N) $f_c = \frac{1}{2\cdot\pi\cdot R\cdot C}$ O) $f_c = \frac{C}{2\cdot\pi\cdot R}$

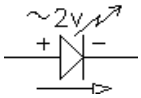
P) $f_c = \frac{R}{2\cdot\pi\cdot L}$ Q) $f_c = \frac{1}{2\cdot\pi\cdot R\cdot L}$ R) $f_c = \frac{L}{2\cdot\pi\cdot R}$

2. (15 pts) Fill in the blanks in the following circuits.

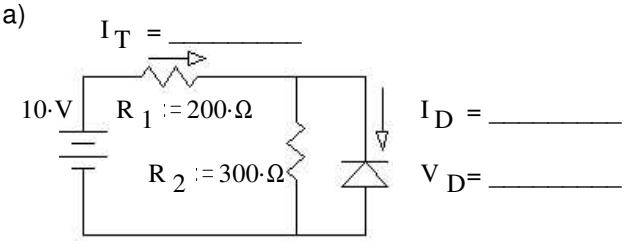
Assume the diodes are silicon with a 0.7V forward voltage drop:



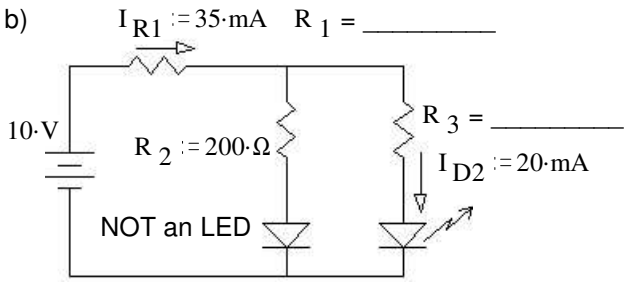
Assume the LEDs have a 2V forward voltage drop:



a)



b)



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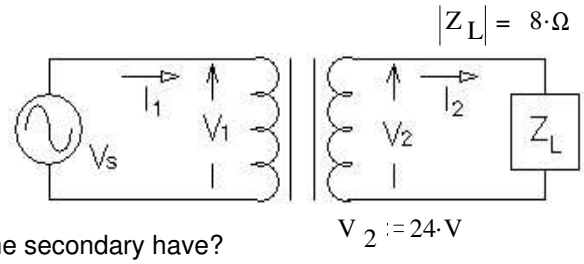
3. (24 pts) A transformer is rated at 125V primary, 25V secondary, and 100VA. Assume the transformer is ideal and all voltages and currents are RMS.



a) What is the current rating of the primary?

b) What is the current rating of the secondary?

c) The primary has 250 turns of wire. How many turns does the secondary have?

d) The magnitude of the secondary voltage ($|V_2|$) is 24 V. What is the magnitude of the primary voltage ($|V_1|$)?

e) The magnitude of the secondary load ($|Z_L|$) is 8 Ω. What is the magnitude of the secondary current ($|_2|$)?

f) What is the magnitude of I_1?

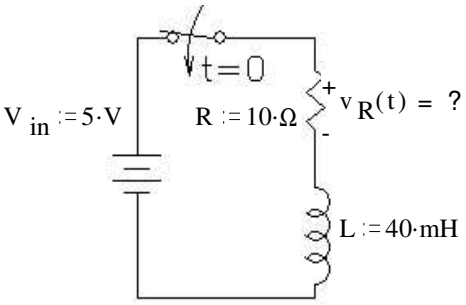
g) The power factor of the load is 85 %. How much power does the load dissipate?

h) What is the phase angle of the load?

i) What is the load as seen by V_S? (magnitude and angle)

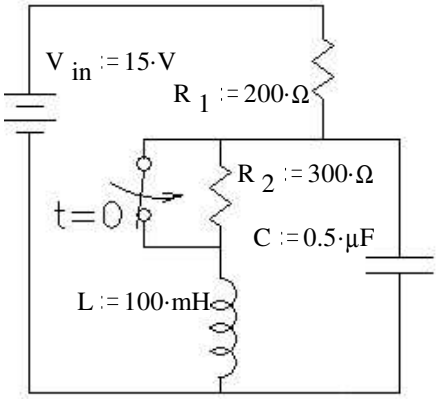
4. (9 pts) Find the resistor voltage as a function of time. You may use any equations or expressions that you already have without deriving anything, but your answer does need all the pertinent numbers.

$v_R(t) = ?$



5. (30 pts) Analysis of the circuit shown yields the characteristic equation below. The switch has been in the open position for a long time and is closed (as shown) at time t = 0. Find the initial and final conditions and write the full expression for $i_L(t)$, including all the constants that you find. Don't let the odd position of the switch throw you, just use it to find your initial conditions.

Clearly show important numbers (like initial and final conditions) to get partial credit. If you can't find some of these, guess so that you can move on.



$$s^2 + \left(\frac{1}{C\cdot R_1}\right)\cdot s + \left(\frac{1}{L\cdot C}\right) = 0$$

$$\left(\frac{1}{C\cdot R_1}\right) = 1\cdot 10^4 \cdot \sec^{-1} \qquad \left(\frac{1}{L\cdot C}\right) = 2\cdot 10^7 \cdot \sec^{-2}$$

$$s^2 + 10000\cdot\frac{1}{\sec}\cdot s + 2\cdot 10^7\cdot\frac{1}{\sec^2} = 0$$

Answers

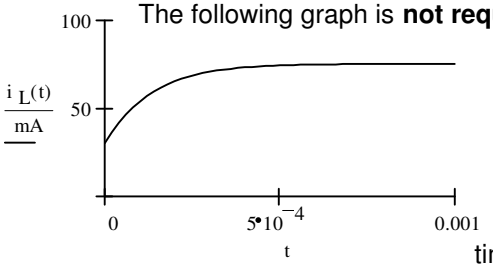
1. F, E, E, F L, K, I, J N, N, P, P 2. a) $20\cdot mA$ $0\cdot mA$ $6\cdot V$ b) $180\cdot\Omega$ $85\cdot\Omega$

3. a) $0.8\cdot A$ b) $4\cdot A$ c) 50 d) $120\cdot V$ e) $3\cdot A$
   f) $0.6\cdot A$ g) $61.2\cdot W$ h) $31.8\cdot deg$ i) $200\cdot\Omega$ $31.8\cdot deg$

4. $v_R(t) = 5\cdot V + (0\cdot V - 5\cdot V)\cdot e^{\frac{t}{0.004\cdot sec}}$

5. $i_L(t) := 75\cdot mA + 2.9\cdot mA\cdot e^{-2764\,t} - 47.9\cdot mA\cdot e^{-7236\,t}$

The following graph is **not required**



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