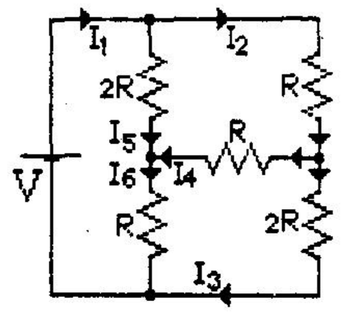
H.U. Fall 2006 Name: ----------

PHY 218
Quiz I

1. For the circuit shown in the figure



a. Write down the KCL equations. *(6 points)*

b. Write down the KVL equations. *(12 points)*

c. Argue (without algebra) that $I_2 = I_6$ and $I_3 = I_5$ *(3 points)*

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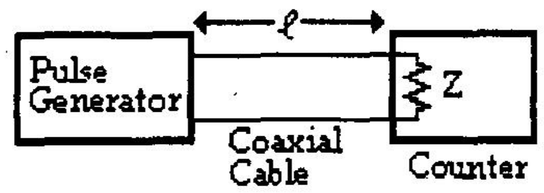
2. A pulse generator is connected to a counter of resistance $Z = 300\Omega$ by a cable of $Z_o = 60\Omega$ and length $\ell = 2m$. Take $v = 2.5 \times 10^8$ m/s.

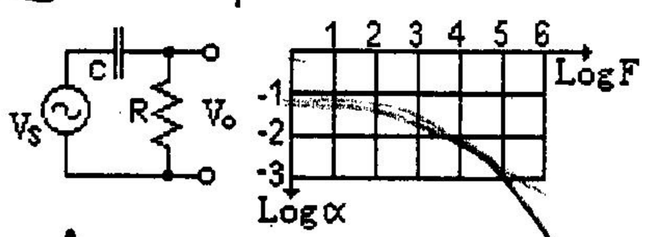


a. Calculate the upper limit of the signal frequency. *(5 points)*

b. Calculate the value of the resistance that must be used to terminate the cable. *(5 points)*

c. Show that the reflection coefficient is 2/3. *(5 points)*

For the RC filter shown answer 3 of the 4 questions below *(3X5=15 pts.)*



a. Argue that it is a low pass and hence $\alpha = 1/[1+(f_o/f)^2]^{1/2}$

b. Take $C = 0.47\mu F$, $R = 339\Omega$ and show that $f_o \simeq 1KHz$

c. Will the circuit integrate or differentiate the input V_s? What is the condition that must be satisfied, $T >> \tau$ or $T << \tau$? Explain briefly.

d. Draw the Bode diagram on the graph provided.

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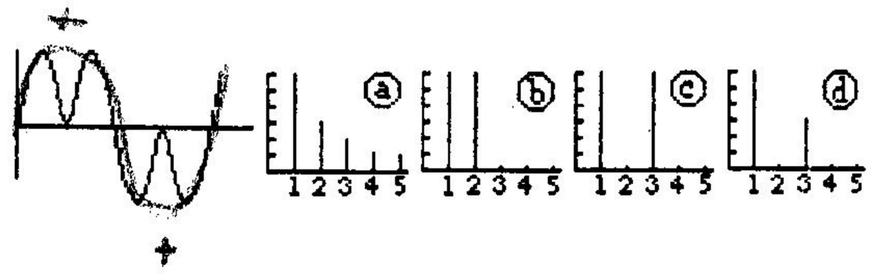
4. Which of the four spectra (a,b,c,or d) belongs to the waveform shown in the figure? Explain your answer clearly.
(No explanation, no points) *(9 points)*



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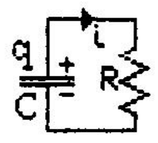
5. Answer 5 of the following 7 questions. *(5 X 8 = 40 points)*
Note: The 6th answer will be ignored.

a. Define impedance matching and give an example.

b. Why does the size of capacitors increase with their value, whereas the size of resistors is independent of their value?

c. Give two reasons why chips cannot contain inductors.

d. For the discharge in the figure opposite show that $dq/dt = -q/RC$



e. Define magnetic flux linkage in transformers

f. Describe the construction of 3 types of commercial resistors

g. For the circuit of question 1.Take $V = 14$ volt and $R = 1$ KΩ and show that $I_1 = 10$ mA
Note: You may use the result of part 1c above.

Good Luck

21 + 2x15 + 9 + 40 = 100