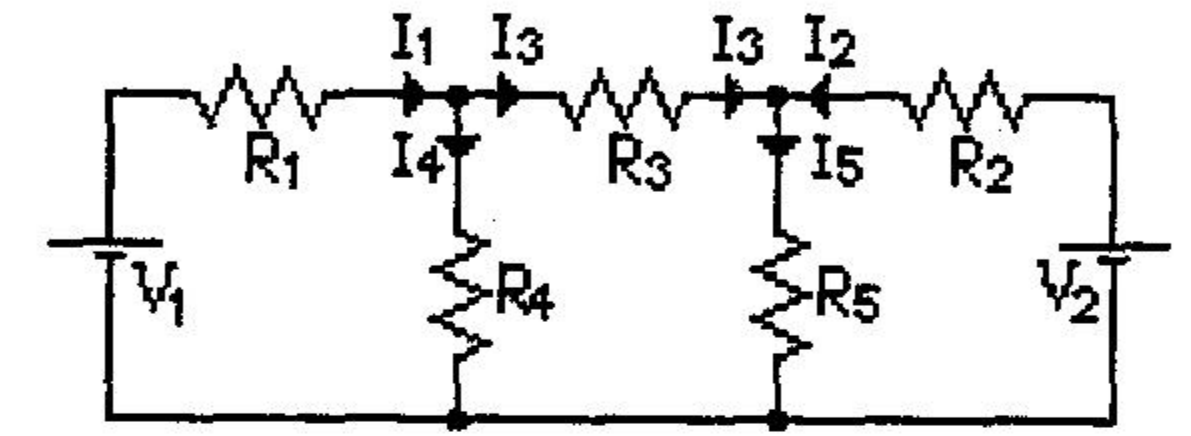


PHY 218
Quiz I

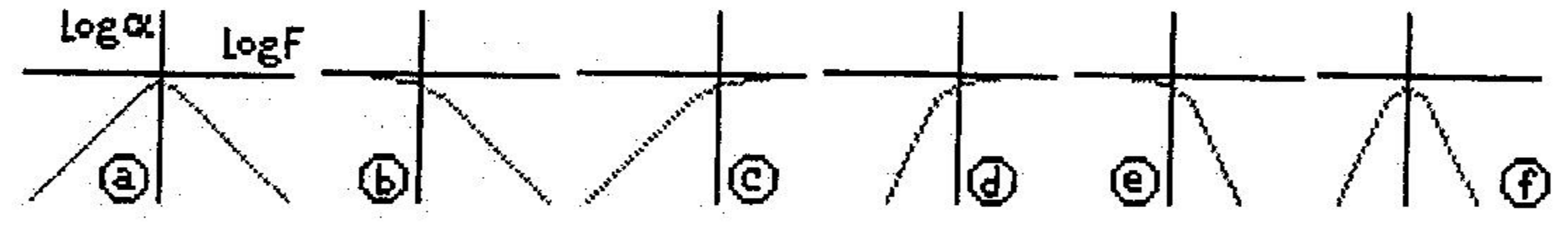
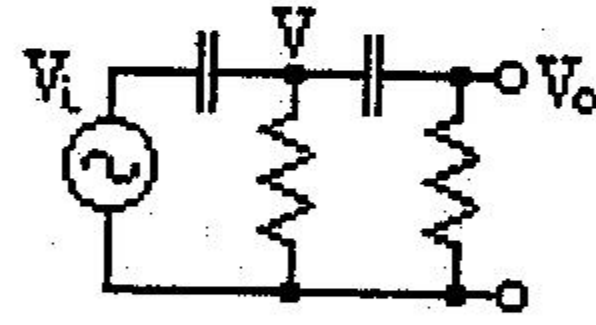
1. Write down the two KCL (4 pts) and three KVL (10 pts) equations for the circuit shown in the figure

Note: There is no need to solve the equations.



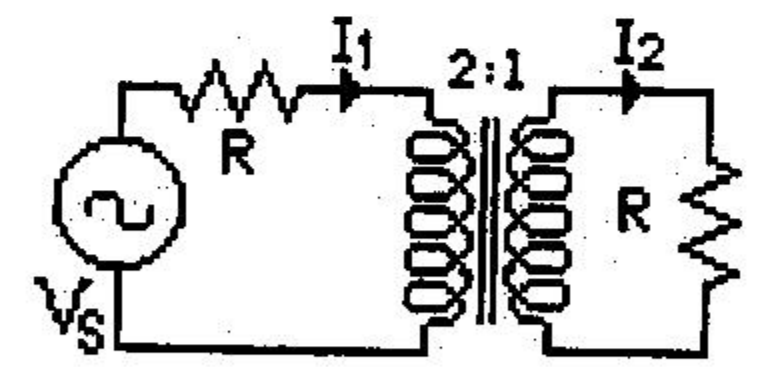
2. a. Use the Nodal method to show that $\alpha = (V_o/V_i) = \chi^2 / (\chi^2 + \chi - 1)$ (15 pts) note $\chi = j\omega RC$

Which of the plots belongs to the circuit? Justify briefly. (5 pts)



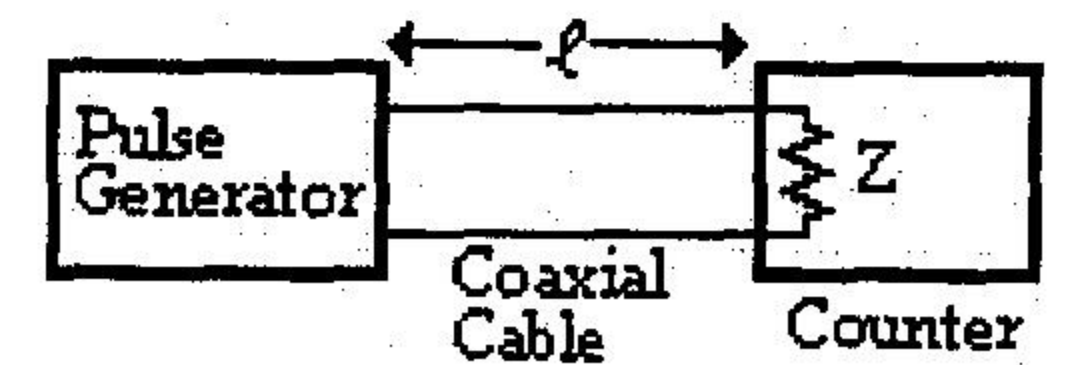
3. Take $V_s = 12V$, $R = 40\Omega$.

- a. Calculate I_1 (10 pts.)
- b. Why isn't there Impedance Match between source and load? (4 pts.)



4. For the transmission line shown, take $Z_o = 50\Omega$, $l = 75cm$, $v = 2.4 \times 10^8 m/s$, and the input impedance of the receiver is $Z = 75\Omega$

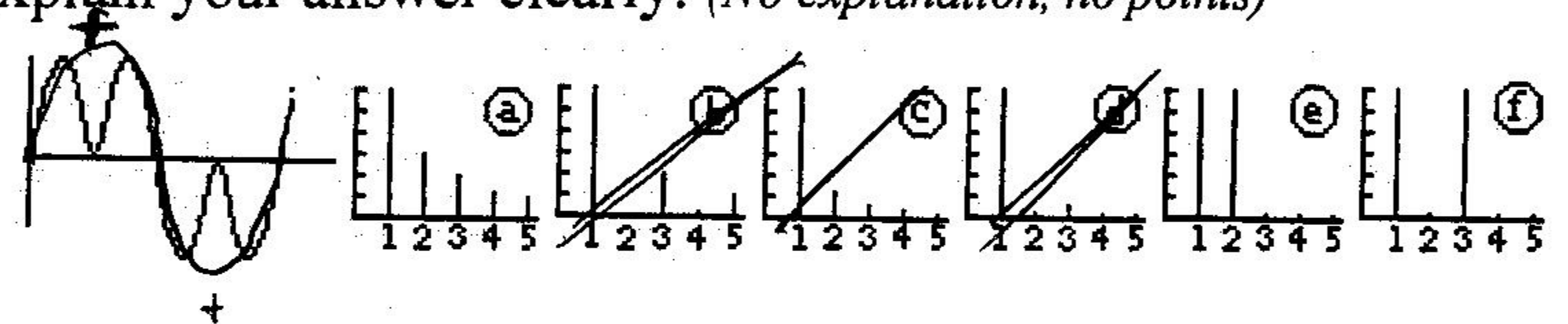
- a. Show that the reflection coefficient is 0.2 (5 points)
- b. Calculate the upper limit of the frequencies. (5 points)



5. Answer 6 of the following 9 questions. (6x7 = 42 points) Note: The 7th answer will be ignored.

- a. Specify the limits for differentiation and integration ($T \gg RC$ or $T \ll RC$)
- b. Why is the product RC constant for a real capacitor?
- c. Why do some resistors have MORE than 4 colour bands?
- d. What were the assumptions made while deriving the formula $C = \epsilon_0 A/d$?
- e. Why is a coaxial cable rather than a parallel pair of wires used in communications?
- f. Mention three uses of transformers.
- g. Why did we plot the $\text{Log}(\alpha)$ versus $\text{Log}(F)$ rather than simply α versus F ?
- h. Why is the quality factor of a parallel LRC circuit directly (not inversely) proportional to R? [$Q = R(C/L)^{1/2}$]
- i. Which of the four spectra belongs to the waveform? Explain your answer clearly. (No explanation, no points)

- a. $A_n = A_1/n$
- b. $A_n = A_1/n$ odd only
- c. $A_n = A_1/n^2$
- d. $A_n = A_1/n^2$ odd only
- e. $A_2 = A_1$
- f. $A_3 = A_1$



Good Luck!

$2 \times 14 + 20 + 10 + 42 = 100$

Bonus:

Argue that an educated guess for the equivalent capacitance of the combination shown is $C_e \sim 2.45C$ (The exact value is $C_e \sim 2 \frac{3}{7} C$)

