

My Lectures from : Purcell Chapter 7.9;Chapter 8.4-8.5

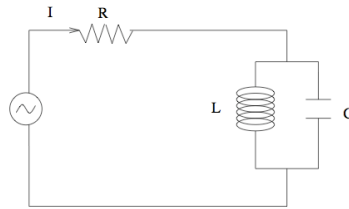
Web Notes : Lecture Notes #4a,4b,4c

Other Notes: Capacitance; AC_circuits

Purcell Problems:

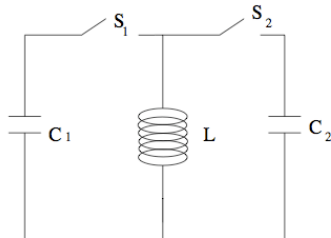
- 7.13 RL circuit
- 7.17 RL circuit
- 8.2 RC circuit
- 8.3 RLC circuit
- 8.10 Real impedance
- 8.14 Equivalent circuits
- 8.15 Impedance at terminals
- 8.16 Required impedance

1. Consider the circuit below.

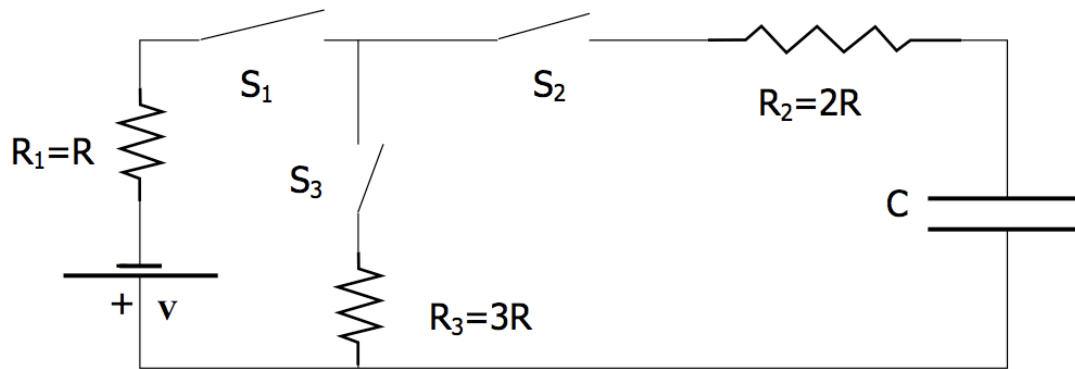


- (a) What is the complex impedance of the circuit elements?
- (b) The AC voltage is given as $V_0 \cos(\omega t)$. What is the current I (the actual current, not the complex current) flowing through the circuit? Find the phase angle.
- (c) Explain the high and low frequency behavior of the phase shift of the current in terms of the currents through each of the circuit elements.

2. Consider the circuit shown below, where C_1 is initially charged to 75 volts. Suppose that C_1 is 10000 μF , C_2 is 3000 μF and L is 15 H. Explain how to open and close the switches so as to discharge C_1 and charge C_2 . Starting at $t = 0$, you should give explicitly times for opening and closing each switch. What is the final voltage across C_2 ?



3. Consider the circuit below.



Initially all switches are open and the capacitor C is discharged.

- (a) At time $t=t_0$, we close S_1 and S_2 simultaneously.
- (b) At time $t=t_1 \gg t_0$, we close S_3 (with S_1 and S_2 still closed)
- (c) At time $t=t_2 \gg t_1$, we open S_1 (S_2 and S_3 still closed)

Sketch how the following quantities vary with time:

- (a) V_C (potential across the capacitor)
- (b) I_{R_2} (current through resistor R_2)
- (c) V_{R_3} (potential across resistor R_3)