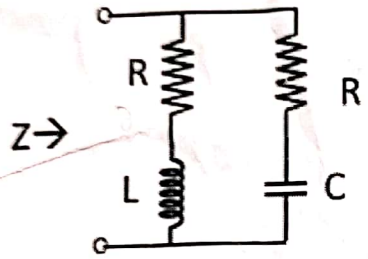
EE 101: Introduction to Electrical and Electronic Circuits, 2019

Midsem

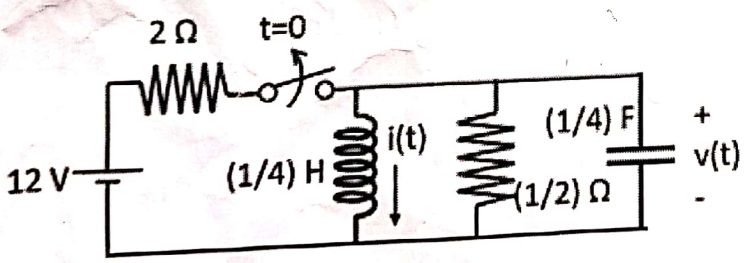
(Show all the steps in the solution properly. Weightage=24%)

1) Consider a piece of Si doped with certain impurities, at 300 K. It was found that the hole concentration is 2.25 X 10^4 /cm^3. Find out the impurity concentration. The impurity belongs to which group of the periodic table (III or V)? Is it p type or n type semiconductor? Assuming that mobility of electrons is 1300 cm^2/Vs and holes is 500 cm^2/Vs, find out the resistivity of doped Si. [4 marks]

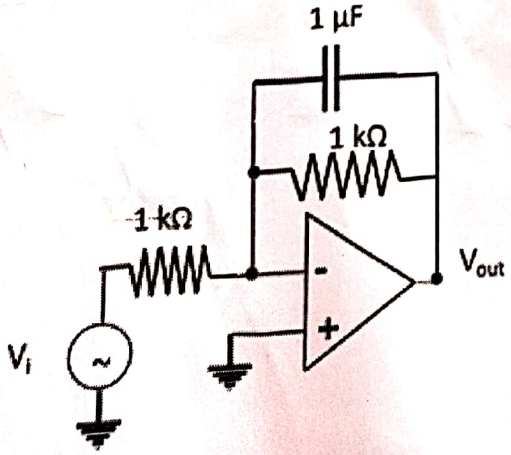
2) The impedance of the circuit shown below is found to be 2 kΩ (real) at all frequencies. If the value of inductor is 1 mH, find out the values of R and C. [5 marks]



3) For the circuit shown below, the switch opens at t=0. Find out and sketch v(t) and i(t), for t=0 to t=∞. [6 marks]



4) Consider the op-amp circuit shown below. Find out the transfer function H(ω). ($H=V_{out}/V_i$). Plot the real and imaginary parts of H as a function of ω. [4 marks]



5) Consider an op-amp circuit shown below. Assume R_1=10 kΩ, R_2=20 kΩ, reference voltage V_r=6 V and V_{CC}=12 V. Find out and plot the complete transfer characteristics (i.e. V_o as a function of V_i) . [5 marks]