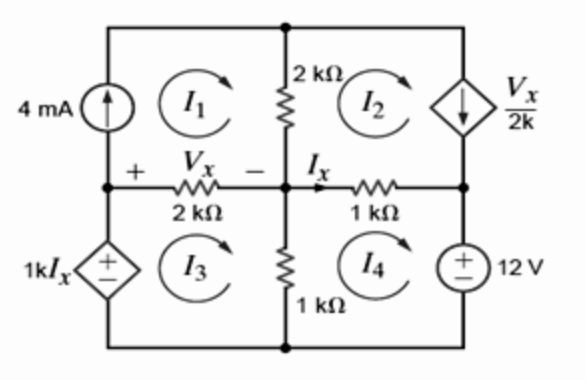
BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE, PILANI
First Semester 2023-2024
EEE F111: Electrical Sciences
Mid Semester Test (Open Book)

Max Marks: 105 **Time: 90 Min** **Date: 09-10-2023**

Note: Attempt all the parts of a question in sequence.

Make neat solutions showing all the necessary steps.

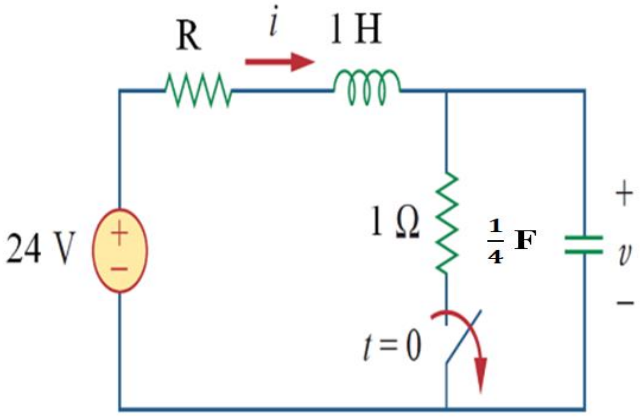
Q1. For the circuit shown in figure, find the loop currents I_1, I_2, I_3, and I_4 using mesh analysis. Also determine the power supplied by independent voltage source. [25]



Q2. Two inductive coils (coil means: resistance in series with inductance) A and B are in parallel across a 100V, 50 Hz supply. Coil A takes 12 A at 0.9 power factor and the total current for both the coils is 20 A at 0.8 power factor. All current and voltages values are in rms. Determine:

a) The equivalent resistance and reactance of the coils combination.
b) The individual resistances and reactances of both coils.
c) The value of capacitance to be connected in parallel with the coils to improve the overall power factor to 0.95 lagging. [30]

Q3. For the circuit shown in figure, assume that the switch has been kept closed for a long time and it is opened at t=0. Determine, *v(t)* and *i(t)* for t ≥ 0s and sketch these functions, when R=1Ω. [25]



Q4(a). For the circuit shown in Fig 4(a) find the following:

i) Find the expression of resonant frequency in terms of circuit elements.

ii) If R_1 = 1 Ω, R_2 = 10 Ω, L = 10 mH, C = 18μF, determine the value of resonant frequency.

iii) Find Z_{in} at the resonance for the values as given in (ii).

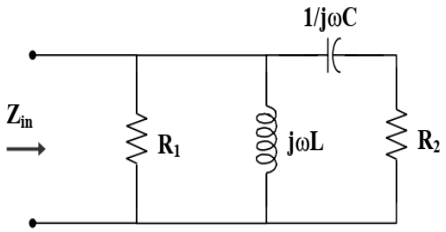


Fig 4(a)

(b). Now, refer Fig 4(b), derive the transfer function V_o/V_{in} in terms of circuit elements and identify the type of filter. Also determine the half power frequencies. [25]

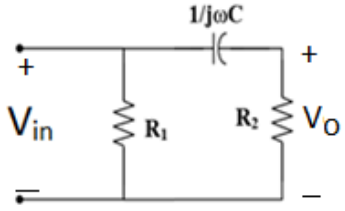


Fig 4(b)