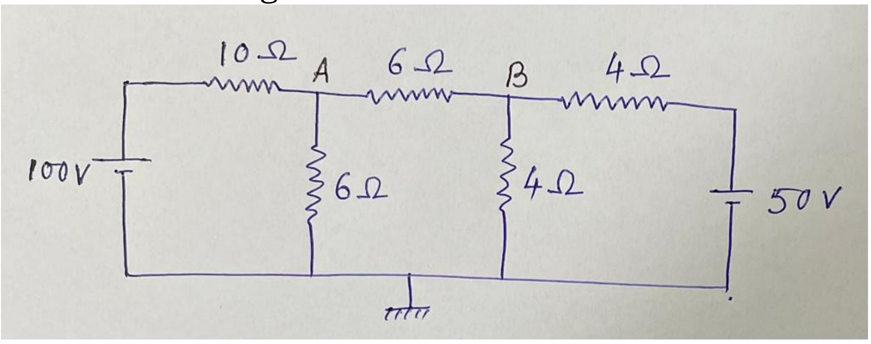
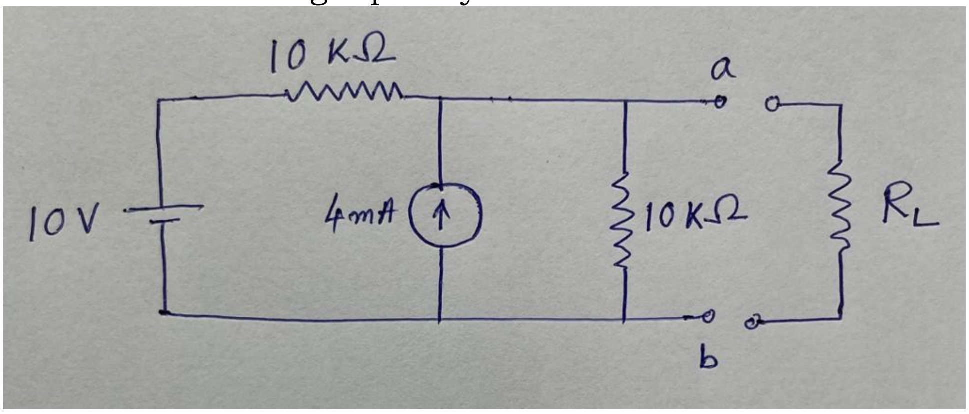
1. Consider the following circuit:



Calculate the voltage at point A and B with respect to the ground. [10]

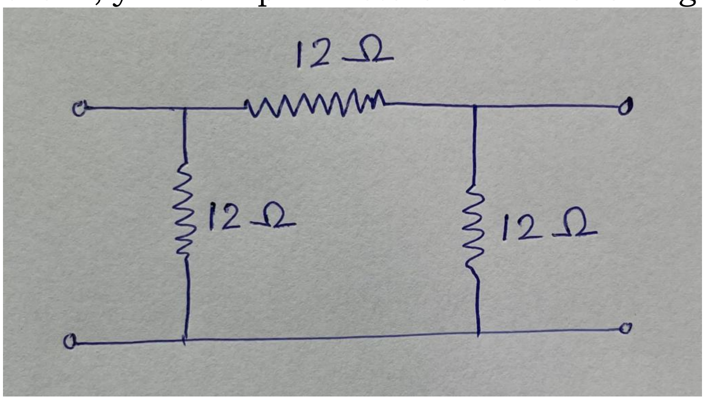
2. Consider the following 1-port system:



Attach load resistors 50 Ω, 500 Ω, 5 kΩ, 50 kΩ and 500 kΩ to the port and calculate the resulting voltage across the load along with the current and power. [5+5+5]

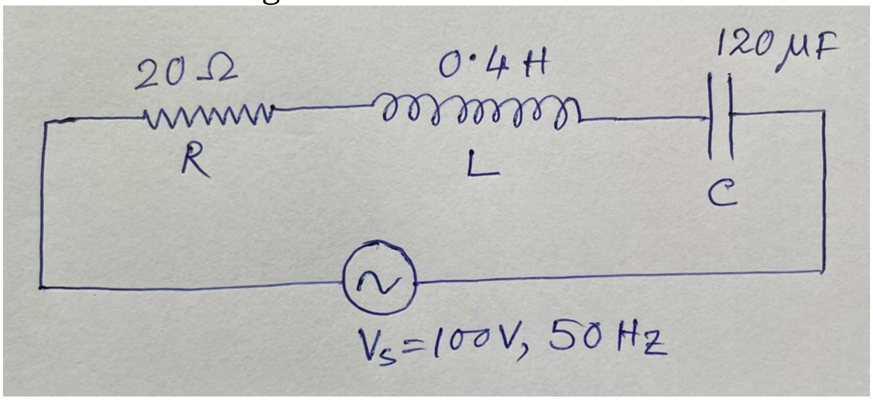
3. Considering the circuit as in the problem 2, construct the Thevenin equivalent circuit. Then calculate the current, voltage and power across a load resistance of 5 kΩ that is connected in the equivalent circuit. [2+1+1+1]

4. Calculate the z-, y- and h-parameters for the following circuit:



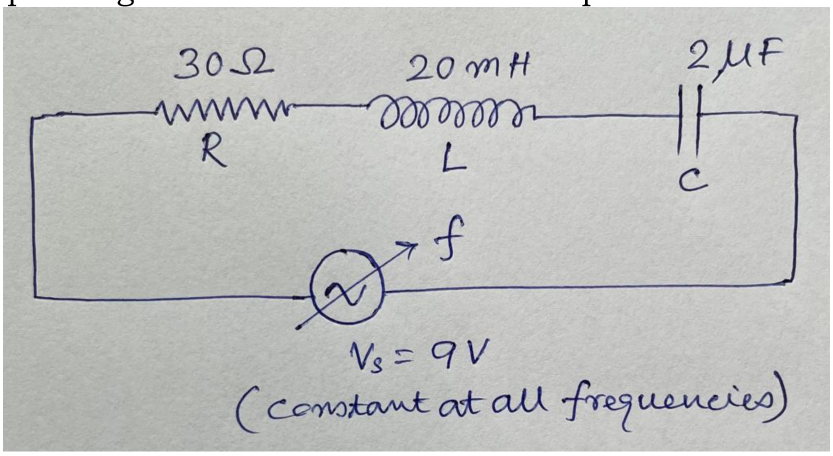
[4+4+4]

5. Consider the following RLC circuit:



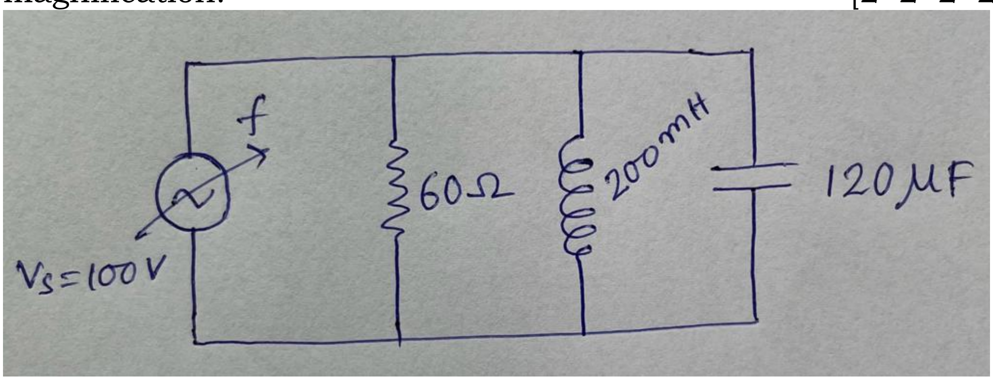
Calculate the total circuit impedance, the circuit current, phase angle and draw the voltage phasor diagram. [2+2+2+2]

6. Consider the following series resonance network and calculate the resonant frequency, the current at resonance, the voltage across the inductor and capacitor at resonance, the quality factor and the bandwidth of the circuit. Also sketch the corresponding current waveform for all frequencies.

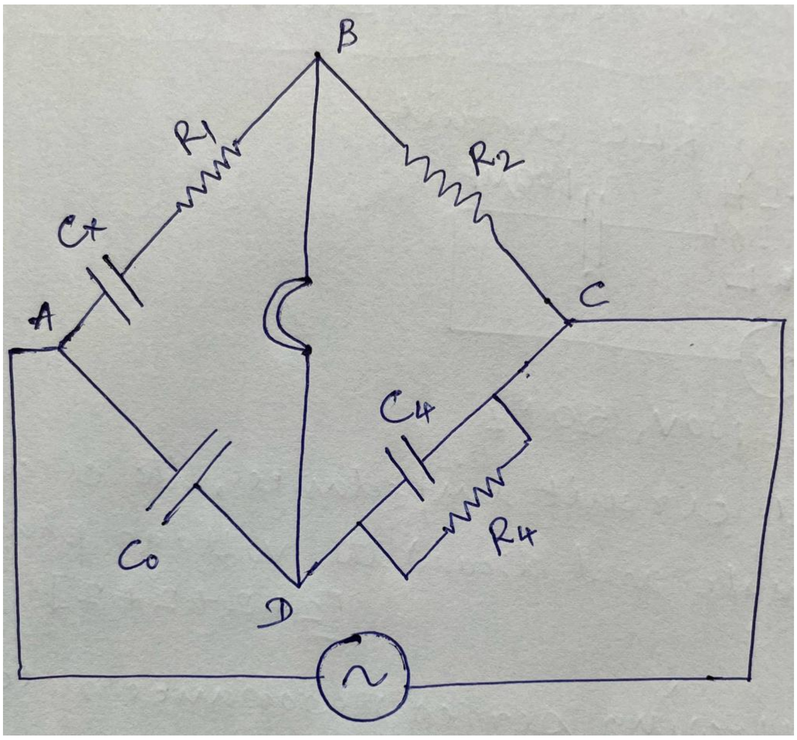


[2+2+1+1+2+3+3]

7. Considering following parallel resonance network, calculate the resonant frequency, the quality factor, the bandwidth of the circuit, the circuit current at resonance and current magnification. [2+2+2+2]



8.



(i) For the above AC bridge, derive an expression to determine the capacitance of the unknown capacitor, i.e. C_x and also the series resistance R_1. [3 + 3]

(ii) If the above bridge is working at a frequency of 2 kHz and the bridge constants at balance are C_0 = 100 μF, C_4 = 50 μF, R_2 = 100 kΩ, R_4 = 50 kΩ, then find the equivalent series circuit of the unknown impedance. [4]