King Fahd University of Petroleum & Minerals
Electrical Engineering Department
EE205: Electric Circuits II
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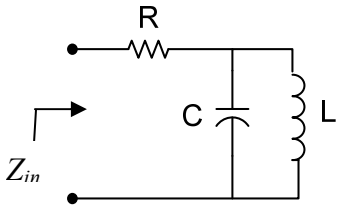
HW 4: Resonant Circuits

Problem 1:

For the circuit shown in the figure

R=10, L=2 H, and $C=\frac{1}{50}$ F



1) Find the input impedance $Z_{in}(jw)$ **(3 points)**
2) Find the input admittance $Y_{in}(jw)$ **(4 points)**
3) Find the resonance frequency. **(3 points)**
4) Find the quality factor of the circuit. **(2 bonus)**
   (*Hint* : assume that you have a voltage test source and then use source transformation)

Simplify $Z_{in}(jw)$ & $Y_{in}(jw)$ as real +j imaginary

Problem 2:

A 10 Ω resistor and a 2 H inductor are connected in parallel and ω= 50 rad/s.

(a) What is the Q of this parallel connection?

(b) What series RL connection has the same impedance as the parallel connection at the given frequency?

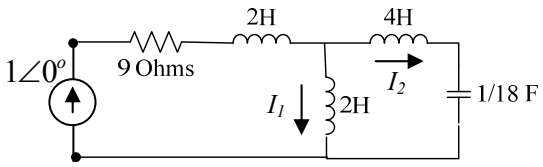
(c) What is the Q of this series connection?

(d) A circuit has the following transfer function, $H(j\omega)=\frac{V_{out}}{V_{input}}=\frac{1}{2+j\omega}$, find the cutoff frequency for this circuit.

Problem 3:

For the circuit shown in the figure, the resonance frequency is $6/\sqrt{10}$ rad/s, to find the quality factor we have applied a test current source of value $1\angle 0^o$ A, and we have found that the current through the 4H inductor is I_2= $2\angle 0^o$ A, the voltage across the capacitor can be found to be $6\sqrt{10}\angle -90^o$ V. Find the quality factor

Hint: continue to find the current in the other inductors.



$$\cos^2\theta=\frac{1}{2}(1+\cos 2\theta)$$

Good Luck, **Dr. Ali Muqaibel**