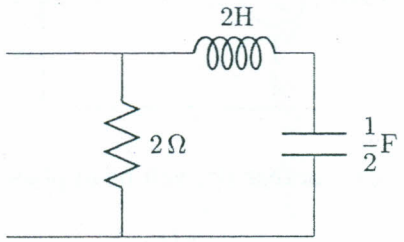
EE101-Electrical Sciences
Mid Sem - 17 September 2013

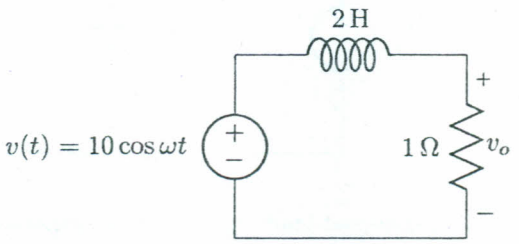
Marks : 30 Time : 2 Hours

Questions 1 to 4 carry 2 marks each

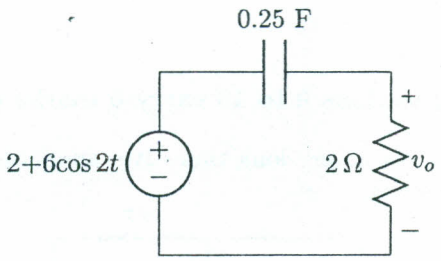
1. Determine the type of damping exhibited by the second order system in the Figure below.



2. Determine the value of frequency at which the output voltage is equal to the input voltage.



3. Determine v_o in the circuit using superposition.



4. The voltage and current at the input of a circuit are given by the expressions

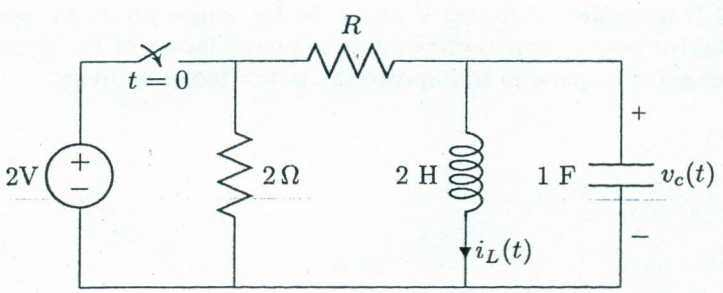
$$v(t) = 170\cos(\omega t + 30°)\,\text{V}$$

$$i(t) = 5\sin(\omega t + 135°)\,\text{A}$$

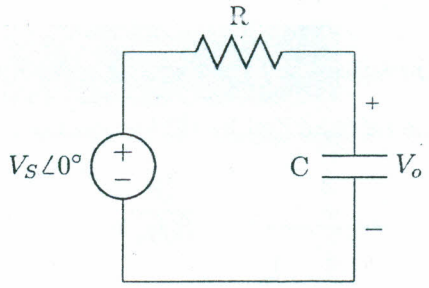
Determine the average power absorbed by the circuit.

Questions 5 to 8 carry 3 marks each

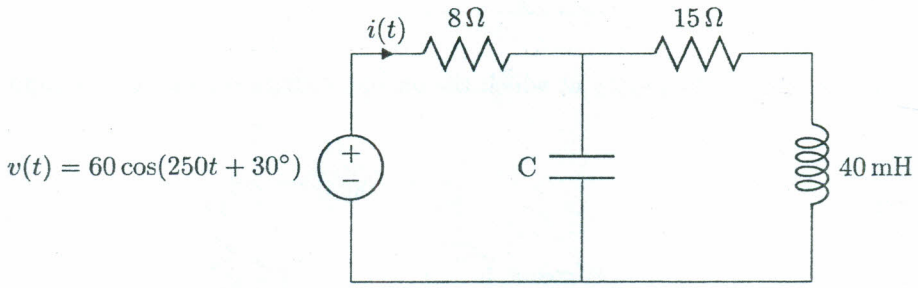
5. What is the value of R so that the response after $t > 0$ will be critically damped. Find $i_L(t)$ and $v_c(t)$ at $t = \infty$.



6. Determine the value of $\left|\frac{V_o}{V_s}\right|$ as a function of ω. What is the value of $\left|\frac{V_o}{V_s}\right|$ at $\omega = 0$ and $\omega = \infty$ rad/s. Plot $\left|\frac{V_o}{V_s}\right|$ Vs ω.



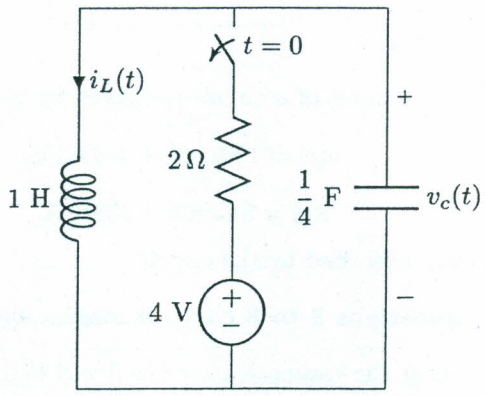
7. Find the value of capacitance, C, so that $i(t)$ will be in phase with source voltage.



8. A three phase balanced star connected load consists of an impedance of 8+j6 Ω. If the line voltage at the load is measured to be 400 V (Line to Line in rms). Find
   (a) the line current
   (b) the apparent power
   (c) the real power

Questions 9 to 10 carry 5 marks each

9. The switch has been closed for a very long time. It is suddenly opened at $t = 0$. Determine $v_c(t)$ and $i(t)$ for $t > 0$ and plot $v_c(t)$.



10. A load of 4+j3 Ω is connected to 230 V (rms), 50 Hz, single phase AC power supply. Determine real power, reactive power, apparent power and power factor of the circuit. What is the value capacitance connected in parallel to improve the power factor to unity.