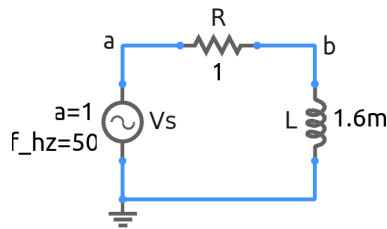


## ee101\_rl\_ac\_1.sqproj



The purpose of this simulation is to study the effect of component values on the frequency response of the series  $RL$  circuit shown in the figure. The simulation is performed in the time domain using the SSW (Steady-State Waveform) analysis which gives directly the steady-state solution. In particular, we are interested in the magnitude and phase of the output voltage ( $V_b$  in the figure).

### Exercise Set

1. Derive expressions for the magnitude and phase of  $V_b$  with  $V_s(t) = V_m \sin \omega t$ , where  $V_m$  is 1 V and the frequency is 50 Hz.
2. For the component values specified in the figure, compute the numerical values of  $|\mathbf{V}_b|$  and  $\angle \mathbf{V}_b$ . Check your answers against simulation results.
3. Keeping  $L$  constant, increase  $R$  by a factor of 2, 3, 4, 5, and simulate the circuit for each case. Plot  $V_a(t)$  and  $V_b(t)$  together for the above cases on the same plot. Comment on the trends seen in the plot.
4. Repeat the above exercise for a constant  $R$  and varying  $L$ .
5. Similarly, make plots for the current waveform and explain the trends you observe in the plots.