1) Design a RC low-pass filter to have cutoff frequency 1,000 Hz. Use a 1.5 \( \mu F \) capacitor. Determine the required value of resistor and accurately sketch the Bode frequency response. Then
   a) Assume that only standard values (as listed in the text, Appendix H) of resistors and capacitors are allowed, and chose standard values for C and R so that the resulting filter has cutoff frequency as close as possible to the desired 1,000 Hz. How much does your resulting design cutoff frequency differ from the desired cutoff frequency of 300 Hz?
   b) Suppose that the R and C component values selected in part a) have 10\% tolerance. Determine the range of cutoff frequency (i.e., minimum to maximum cutoff frequencies).

2) A passive circuit has transfer function \( \frac{V_0(s)}{V_i(s)} = H(s) = \frac{2}{s+4} \). Assume zero initial conditions.
   a) Find the steady-state response to the circuit input \( v_i(t) = 180 \cos(4t) u(t) \).
   b) Use Laplace transform techniques to find the complete response, \( v_0(t) \), for \( t \geq 0 \). Compare the answers in a) and b).

3) Design a (RLC loop) 2\textsuperscript{nd}-order \textbf{high-pass} filter (input voltage \( v_i(t) \), output voltage \( v_o(t) \) across the inductor) with -3 dB cutoff frequency 1,000 Hz. Design the filter so that the transfer function denominator is of the form \( s^2 + \sqrt{2} \omega_c s + \omega_c^2 \), where \( \omega_c \) is the cutoff frequency. Use a 1 \( \mu F \) capacitor for your design and specify the required values of R and L. Determine the transfer function, \( H(s) \), for your design, identify all finite poles and zeros, and sketch their location in the s-plane. Use Matlab to plot the Bode frequency response, and verify that the frequency response magnitude is -3 dB at frequency 1 kHz. Finally, for your design, determine the \textit{steady-state} response to the inputs
   a) \( v_i(t) = 120 \sin(2 \pi 100t) \) \( u(t) \);
   b) \( v_i(t) = 40 \cos(2 \pi 1000t) \) \( u(t) \);

4) Text, problem 14.2.
5) Text, problem 14.5.