Write your name at the top right corner of every page
(including this cover page and any extra pages).
In the page header: Please place a checkmark behind the course you are enrolled in: 6610 (Graduate) or 3610 (Undergraduate).

Copy everything you want counted towards your grade onto the pages that I provided. Use the extra pages I provide if necessary.

Write with a pen that cannot be erased!

No books and none of your own calculators are allowed! Use the calculators that we provide.

Write down all the steps that lead to your result. If we cannot see how you arrived at the result, no points will be awarded.

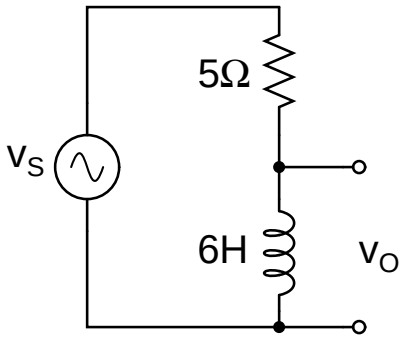
Clearly identify all variables that you may introduce in the circuit diagrams.

Read all the problems before you start so that you can begin with those that seem easiest to you.

The last problem is for the 6610 students only. Should students from 3610 attempt to solve the problem, points they gain may be used to proportionally replace the lowest scoring problem in their main section. In other words: Should a 3610 student get 100% on the last problem but e.g. a lowest score of only 50% on the first problem, the complete score for that student will be calculated with 100% of the points for the first problem replacing the actually achieved 50% of points on the respective first problem.
Students from 3610 are not required to do the last problem!

Problem 1 (8 pts):

If the input voltage from the AC voltage source is $v_S = 13\cos(2t - 22.6\text{deg})$V, write the phasor for the output voltage v_O across the inductor.



(continuation of problem 1)

Problem 2 (12 pts):

Draw the straight-line approximation to the Bode plot for the following transfer function (Bode plot means both: Phase and magnitude; you can draw them in separate plots though):

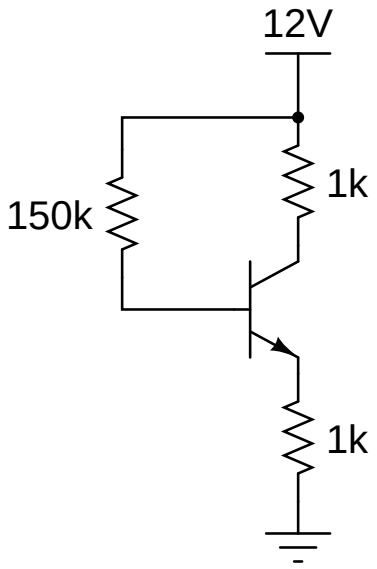
$G(s) = \frac{100s^2}{(s+10)(s+0.1)(s+100)}$

List the corner frequencies (in rad/sec). What kind of filter is it?

(continuation of problem 2)

Problem 3 (8 pts):

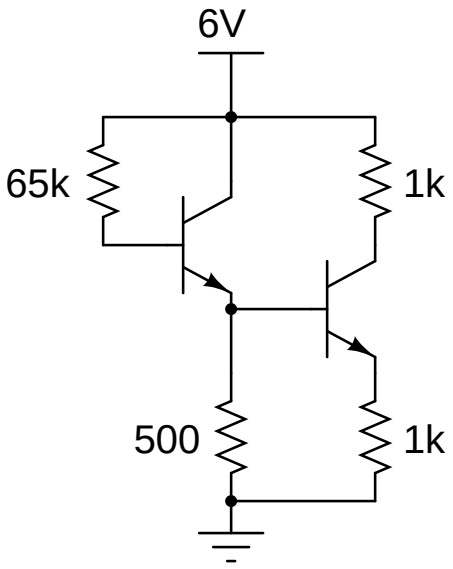
The transistor in the circuit below has $\beta = 100$. Verify that it is in the active region by calculating v_{CE}. Is the transistor a pnp or a npn transistor? What is the requirement on v_{CE} for this transistor to be in the active region? Write this requirement down explicitly.



(continuation of problem 3)

Problem 4 (12 pts):

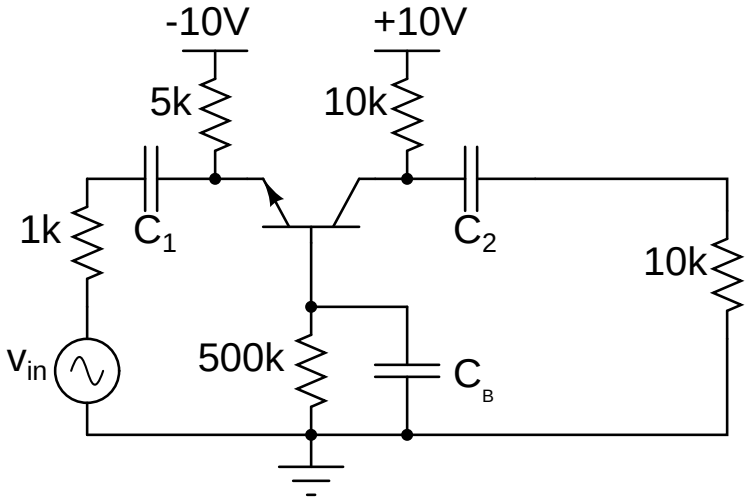
In the circuit below both transistors have $\beta = 100$. Calculate v_{CE} for both transistors and verify that both are in the active region. As always: Label all your variables in the circuit schematic!



(continuation of problem 4)

Problem 5 (12 pts):

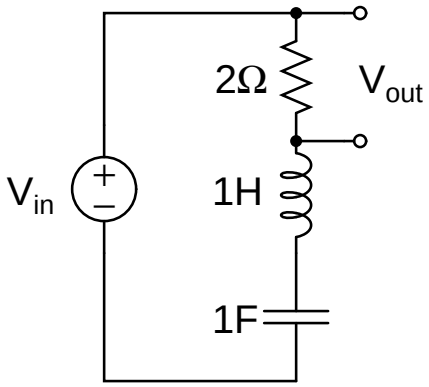
Below you see a common base amplifier. Draw the ac-equivalent circuit with an appropriate small-signal model for the BJT. Find the small signal voltage gain v_c/v_e if $h_{fe} = 100$ and $I_{CQ} = 0.93$mA.



(continuation of problem 5)

Problem 6 ONLY 6610 students !!! (12 pts):

Construct the straight line approximation to the Bode plot for the transfer function V_{in}/V_{out} of the circuit below, where V_{out} is the voltage across the resistor.



(continuation of problem 6)