

Exam – 11.4.2011

You may not use any notes, but use of your own calculator is allowed.

Each question is worth ten points, making the total maximum 50 points. Good luck!

1. Provide the following definitions or answers briefly (1pt per correct answer):

- Voltage gain
- Current Gain
- Loading effect
- Inverting and non-inverting amplifier
- Current gain β of a BJT
- How much is the input impedance of an ideal op-amp?
- Buffer (in voltage amplifiers)
- Poles and zeros
- Summing-point constraint
- Feedback

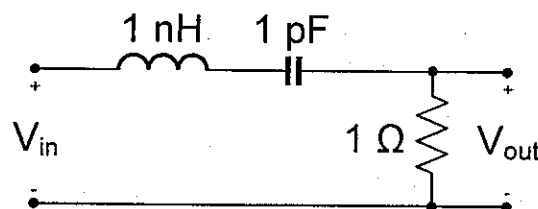
2. Plot by hand the output characteristics of an NMOS FET, name the different regions of operation and explain how their borders are defined.

3. Draw the circuit of an inverting amplifier realized with an operational amplifier. Derive the formulas for its voltage gain and input resistance.

4. Design a four-resistor bias circuit for an *npn* BJT so that $I_C = 10$ mA and $V_{CE} = 5$ V. The power supply is 15 V, and the BJT has $\beta = 100$ and $V_{BE} = 0.7$ V. Assume room temperature.

5. (a) Plot by hand the generalized behavior of the impedance (y-axis) vs. frequency (x-axis) of a parallel-resonance LC circuit and a series-resonance LC circuit.

(b) What is the center frequency and Q of the series resonance circuit shown below?



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