

**Home Assignment # 2**  
**ECE - 315 [Only for BTech Students]**

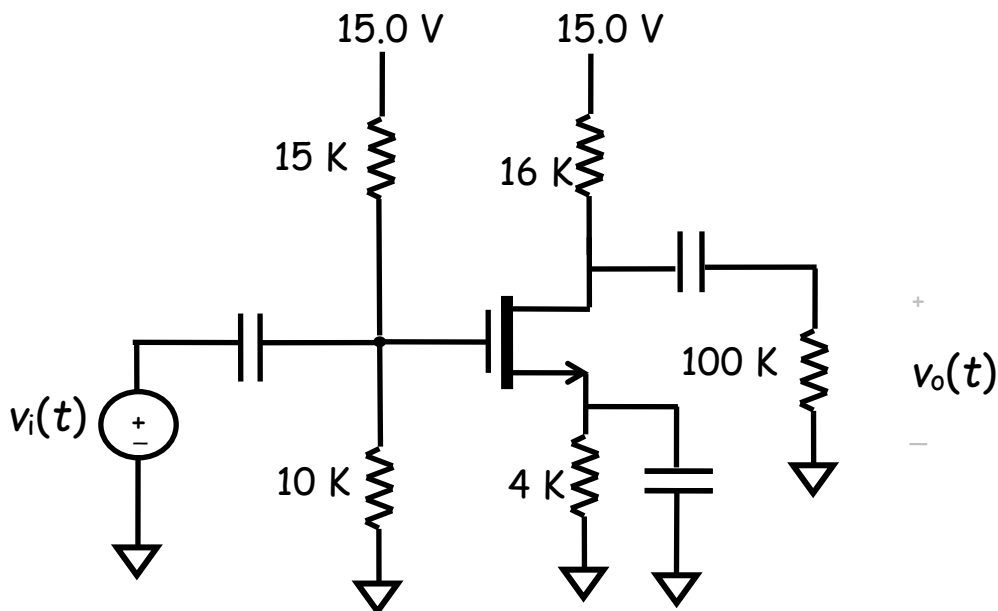
**Due Date: 11<sup>th</sup> Sept 2015**

**Total Marks: 10**

**Q1:** The threshold voltage of the transistor is  $V_T = 2.0$  Volts,  $K = 0.125$  mA/V<sup>2</sup>.

The capacitors are **very** large.

Find the **small-signal gain**  $A_v = v_o/v_i$  of this amplifier.

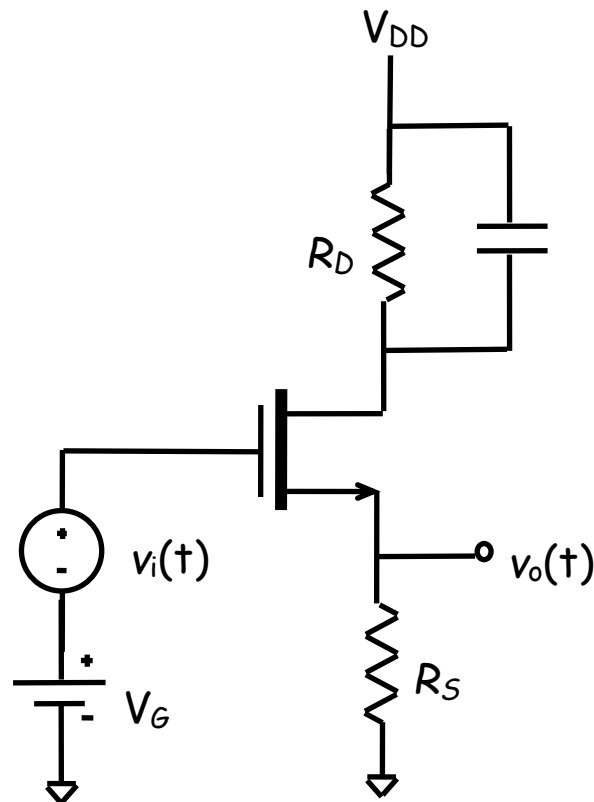


**Q2:** For the circuit below,  $V_G$  is the DC bias at the gate,  $v_i$  is the small-signal input and  $v_o$  the small-signal output. The transistor is known to be in the **saturation** region.

The **capacitor** in the circuit is **extremely large**.

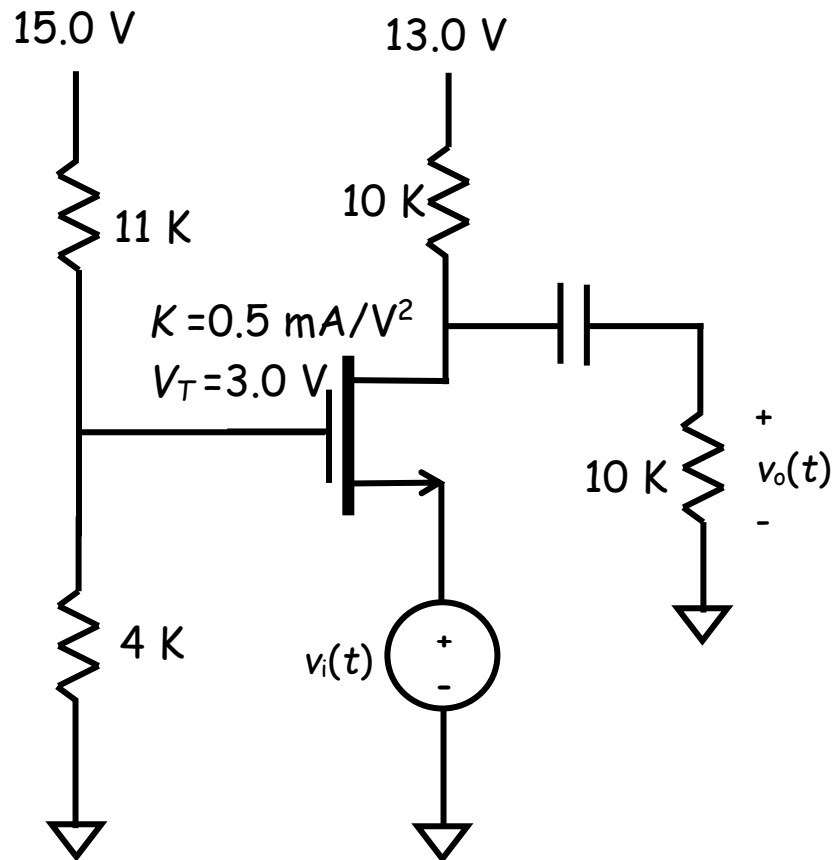
- 1) Draw the resulting **small-signal** circuit.
- 2) In terms of  $g_m$ , find the small-signal **gain**  $A_v = v_o/v_i$ .

**NOTE:** Do **not** attempt any **DC analysis**; provide your solutions directly in terms of  $g_m$ . Ignore the output resistance (i.e.,  $r_o = \infty$ ).



**Q3:** The capacitor in the circuit below is **very** large.

Determine the **small-signal voltage gain** ( $A_v = v_o/v_i$ ) of the **amplifier** below.



**Q4:** Take the example 3.1 (solved) in your text book on page 50. Demonstrate both the curves using Eldo and Cadence Tools.

**Q5:** The capacitors in the circuit below are **very** large.

I have completed the **DC analysis**—I determined that  $V_{GS} = 4.0 \text{ V}$ , and **CHECKED** that the MOSFET is in **saturation**.

Finish the remainder of the analysis, to:

1. Determine and carefully draw the simplified small-signal circuit (be complete and precise!).
2. Determine the **small-signal voltage gain** ( $A_v = v_o/v_i$ ) of the **amplifier** below.

