



King Fahd University of Petroleum & Minerals
Electrical Engineering Department
Fall 2011 (111)

EE 203 – Exam II
Wednesday, November 30, 2011
6:00-7:30 PM

Name	
ID	

	Dr. W. Mesbah	Dr. O. Hammi
Section	1 and 2	3 and 4

Problem	Grade
1 (20 points)	
2 (20 points)	
3 (20 points)	
Total (60 points)	

Question 1:

For the amplifier circuit shown in Figure 1, $R_{sig}=10k\Omega$, $R_G=100k\Omega$ and $R_L=1k\Omega$. The MOSFET transistor is biased to have $g_m=5mA/V$ and $r_o=16.5k\Omega$.

- Draw the small-signal equivalent circuit using the T-model of the transistor. **[4 points]**
- What is the output resistance of the amplifier? **[4 points]**
- Find the voltage gain $A_v (=v_o/v_{in})$ of this amplifier. **[4 points]**
- What will the voltage gain become when the load resistance R_L is replaced by an open circuit? **[4 points]**
- What is the overall voltage gain $G_v (=v_o/v_{sig})$ of the amplifier? **[4 points]**

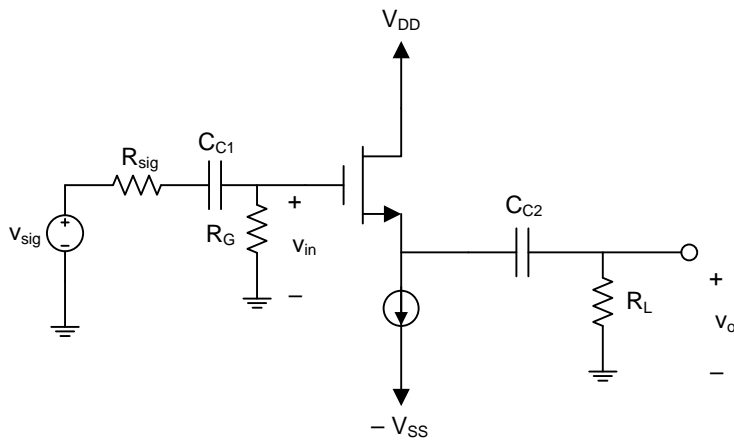


Figure 1

Question 2 – Part A:

For the circuit shown in Figure 2. The input voltage $V_I=5\text{ V}$. If needed, use the following:

$\beta=100$, $|V_{BE}|=0.7\text{ V}$, and $|V_{CEsat}|=0.2\text{ V}$.

- a) Find the base and collector currents. [4 points]
- b) Find the base and collector voltages. [4 points]
- c) Verify any assumption made on the mode of operation of the transistor. [2 points]

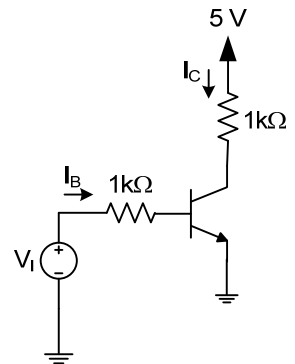


Figure 2

Question 2 – Part B:

For the circuit shown in Figure 3, $V_B = 4.3 \text{ V}$ and $V_C = 2.3 \text{ V}$. If needed, use the following:

$$|V_{BE}| = 0.7 \text{ V}, \text{ and } |V_{CEsat}| = 0.2 \text{ V}.$$

a) What is the mode of operation of this transistor? Verify your answer.

[4 points]

b) Find the value of β .

[6 points]

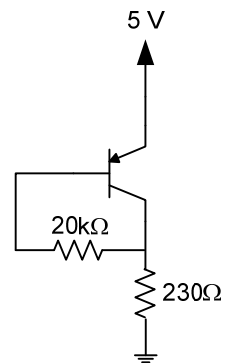


Figure 3

Question 3:

For the circuit shown in Figure 4. The BJT transistor has $\beta=100$.

- a) What is the type of the amplifier shown in Figure 4? [2 points]
- b) Draw the amplifier DC circuit. [3 points]
- c) Calculate the small-signal parameters g_m and r_e . [4 points]
- d) Draw the small-signal equivalent circuit using the π model for the BJT. [4 points]
- e) Find the input and output resistances of this amplifier. [3 points]
- f) Calculate the voltage gain of this amplifier. [4 points]

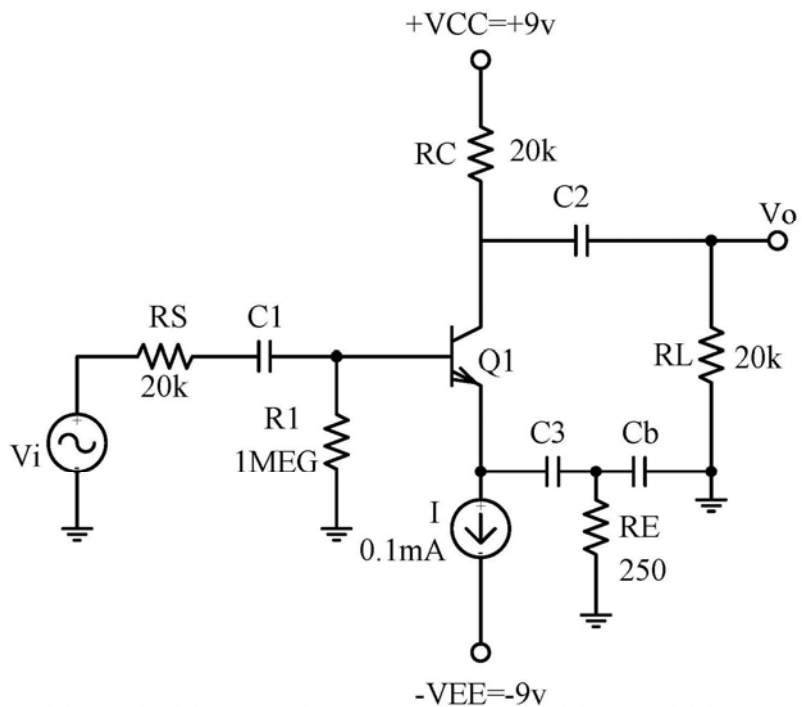


Figure 4

