



King Fahd University of Petroleum & Minerals  
Electrical Engineering Department

EE 203 – Exam II (062)  
May 12, 2007

Name	
ID	

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Section	1	2	3	4 5	6 7

- Solve all problems.
- Total exam time is 90 minutes.

Problem	Grade
<b>Problem 1, Part A</b> [20 points]	
<b>Problem 1, Part B</b> [20 points]	
<b>Problem 2, Part A</b> [20 points]	
<b>Problem 2, Part B</b> [20 points]	
<b>Problem 3</b> [20 points]	
<b>Total [100 points]</b>	

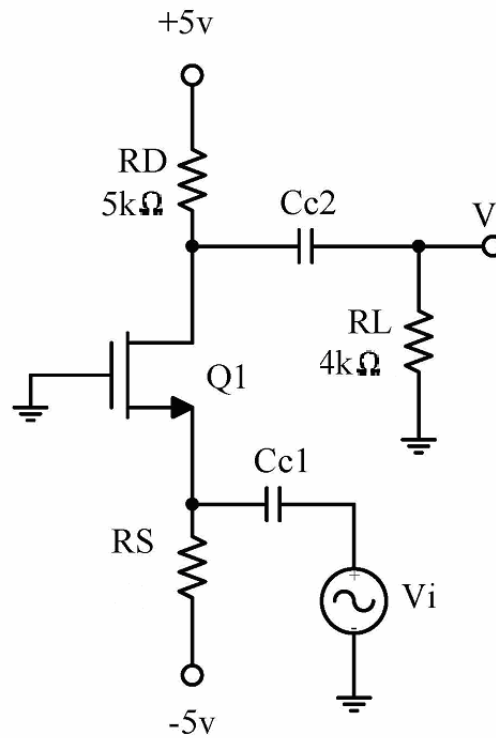
## Problem 1

### Part A

[20 points]

Consider the MOSFET amplifier circuit shown, assume  $\lambda=0$ ,  $V_t=1\text{V}$  and  $\mu C_{ox}W/L=5.5\text{mA/V}^2$ .

- Draw the DC circuit
- Design the circuit (find  $R_s$ ) such that  $g_m=5\text{mA/V}$ .



## **Problem 1**

### **Part B**

**[20 points]**

For the amplifier circuit in part A

- i) Draw the amplifier small signal equivalent circuit.
- ii) Calculate the voltage gain of the amplifier.
- iii) Calculate the input and output resistance.

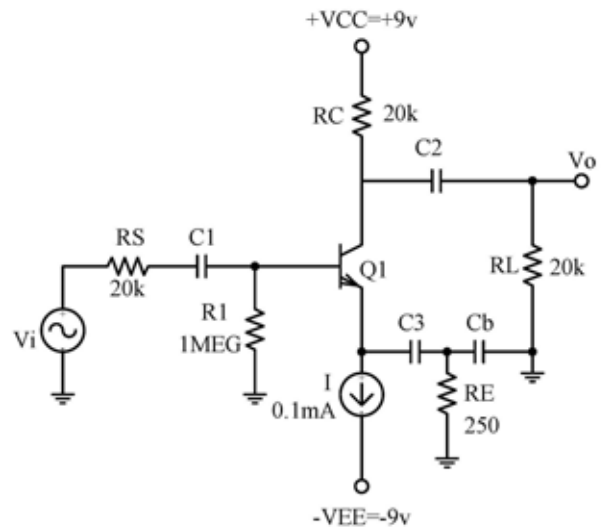
## Problem 2

### Part A

[20 points]

The circuit shown is a BJT amplifier with large  $\beta$  and an early effect voltage  $V_A=100$

- What is the type of the amplifier?
- Draw the amplifier DC circuit
- What are the values of  $I_E$ ,  $I_C$  and  $I_B$
- Calculate the small signal parameters  $g_m$  &  $r_e$



## Problem 2

### Part B

[20 points]

For the amplifier circuit in part A

- i) Draw the amplifier small signal equivalent circuit using  $\pi$  model
- ii) Drive an expression for the voltage gain and find its value
- iii) Find the input and output resistance
- iv) If the capacitor  $C_b$  is removed, comment on its effect on the gain

**Problem 3****[20 points]**

For the differential amplifier shown, assume identical transistors with large  $V_A$ . Find  $I_{E1}$ ,  $I_{E2}$ ,  $V_{C1}$ , and  $V_{C2}$ , for the following cases:

- i)  $R_{C1} = R_{C2} = 5\text{k}\Omega$
- ii)  $R_{C1} = 0\ \Omega$  and  $R_{C2} = 5\text{k}\Omega$
- iii)  $R_{C1} = 0\ \Omega$ ,  $R_{C2} = 5\text{k}\Omega$  and a resistor  $R_{EE} = 20\ \text{k}\Omega$  is connected in parallel with the current source.

