


Ministry of Higher Education <b>King Fahd University of Petroleum &amp; Minerals</b> Electrical Engineering Department		وزارة التعليم العالي <b>جامعة الملك فهد للبترول والمعادن</b> قسم الهندسة الكهربائية
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Major Exam # 2

Electronics I EE 203

Name	
ID#	

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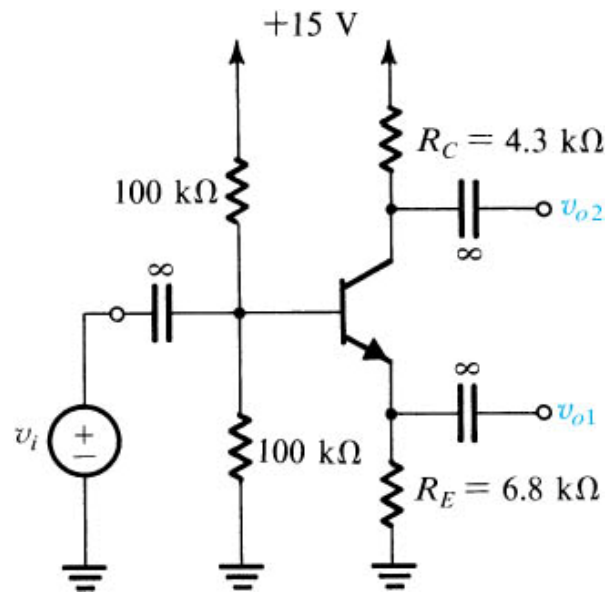
Date: December 4, 2007

Time: 6:30-8:00pm

Problem #1	
Problem # 2	
Problem # 3	
<b>Total Grade</b>	

**Problem # 1 (10) points**

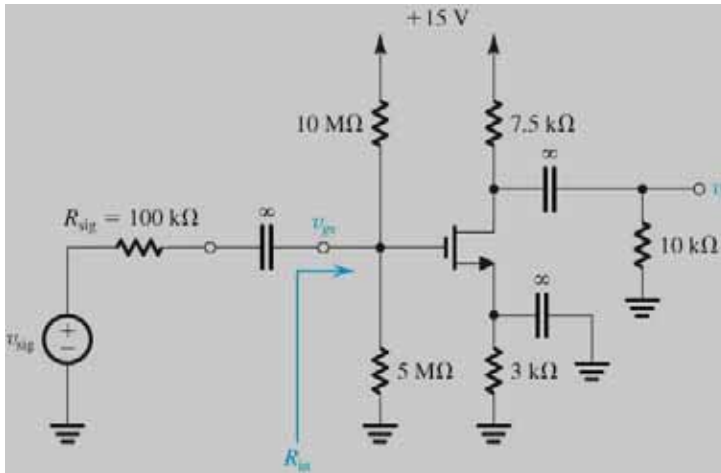
In the circuit shown,  $\beta$  is large. Find  $I_C$ ,  $V_D$ ,  $V_E$ ,  $g_m$  and  $r_e$



## Problem # 2

Consider the circuit shown below, with the NMOS transistor operating in saturation. Assume the following values:  $V_{GS} = 2V$ ,  $V_{th} = 1V$ ,  $K_n W/L = 2mA/V^2$ ,

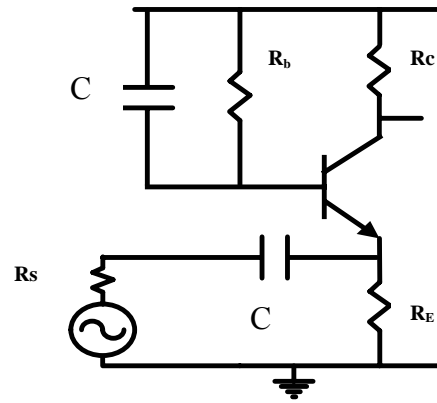
- What type of circuit is this? (specify exactly)
- Show that  $g_m = 2mA/v$
- Draw the small-signal equivalent model for the whole circuit
- Derive the expression and compute the voltage gain  $v_o/v_{sig}$
- Find the input resistance  $R_i$
- Find the output resistance  $R_o$
- If the bypass capacitor is removed what will be the effect on the voltage gain



### **Problem # 3**

For the common-base amplifier shown, assume  $\beta=100$ ,

- (a) Perform DC analysis to determine  $I_C$  and confirm that the transistor is working in active mode.
- (b) Replace the transistor with its T-model and draw the amplifier small signal equivalent circuit.
- (c) Calculate the voltage gain  $v_o/v_s$ .
- (d) Calculate the input resistance
- (f) What is the value of the output resistance?



$V_{CC}=5V$
$R_b=100k$
$R_C=1k$
$R_E=500\Omega$
$R_S=60\Omega$