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	
Total Grade	

Problem # 1 (10) points

In the circuit shown, β is large. Find I_C, V_D, V_E, g_m and r_e

+15 V

$R_C = 4.3\ \mathrm{k\Omega}$

100 kΩ

v_{o2}

∞

v_{o1}

v_i

100 kΩ

$R_E = 6.8\ \mathrm{k\Omega}$
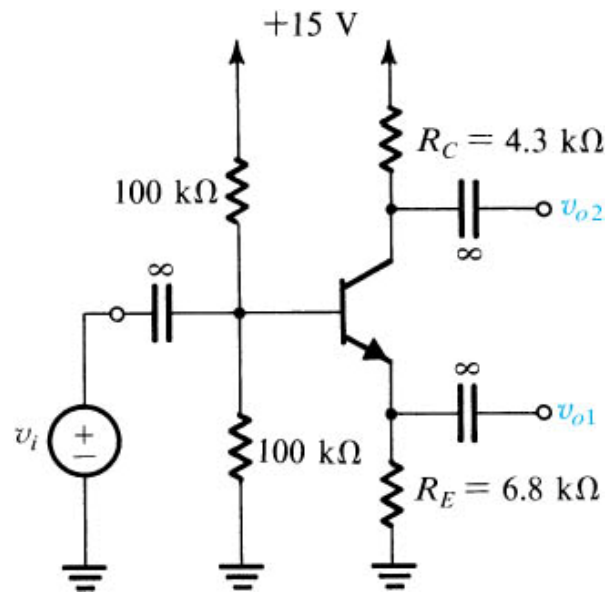
Problem # 2

Consider the circuit shown below, with the NMOS transistor operating in saturation. Assume the following values: $V_{GS}=2V$, $V_{th}=1V$, $K_n'W/L = 2mA/V^2$,
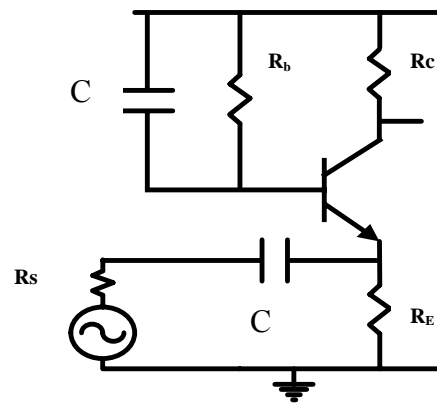
(a) What type of circuit is this? (specify exactly)
(b) Show that $g_m=2mA/v$
(c) Draw the small-signal equivalent model for the whole circuit
(d) Derive the expression and compute the voltage gain v_o/v_{sig}
(e) Find the input resistance R_i
(f) Find the output resistance R_o
(g) If the bypass capacitor is removed what will be the effect on the voltage gain
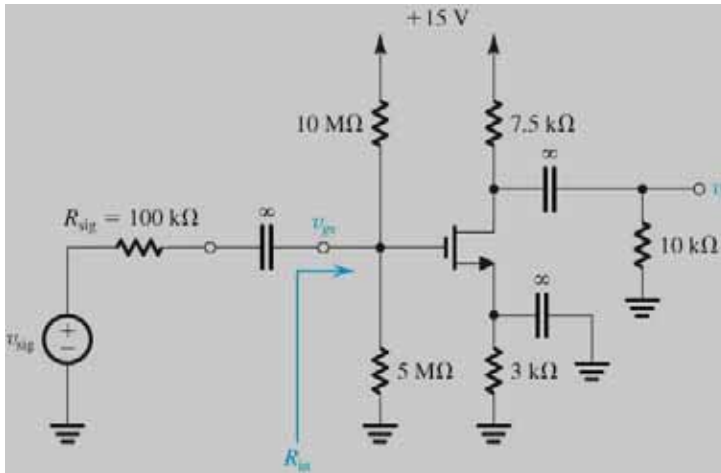
Problem # 3

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 vo/vs,
(d) Calculate the input resistance
(f) What is the value of the output resistance?

VCC=5V
$R_b = 100k$
$R_C=1k$
$R_E=500\Omega$
$R_S = 60\Omega$