ELE222E INTRODUCTION TO ELECTRONICS (21506)
Midterm Exam #2 – 20 April 2009 – 9:30– 11:30
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1. For the circuit shown in Figure 1:

$(W/L)_1 = (W/L)_2 = 8$, $(W/L)_3 = (W/L)_4 = 24$; I_B =100 μA
$\mu_n C_{ox} = 100\mu A/V^2$, $\mu_p C_{ox} = 33\mu A/V^2$; $V_{THn} = 0.5V$, $V_{THp} = -0.6V$;
$V_{An} = 75V$, $V_{Ap} = 50V$;

a) Assuming all the transistors operate in saturation region calculate the small signal gain v_o / v_i and output impedance r_o. (20)

b) For $v_i = 10mV$ peak to peak sine wave, sketch the node voltages V_1, V_2 and V_o as a function of time. (30)

c) Find the I_B interval in order to satisfy saturation condition. (20 bonus !!!)

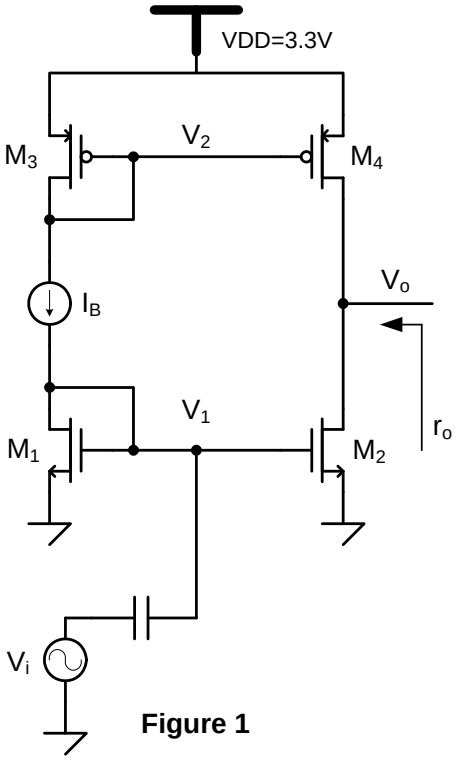

Figure 1

2. For the circuit shown in Figure 2:

$|V_{BE}| = 0.6V$, $V_T = 25mV$,
$H_{FE} = h_{fe} = 250$, $V_A = \infty$,
$R_1 = 100k\Omega$, $R_3 = 1k\Omega$, $R_4 = 15k\Omega$,
$R_5 = 3.3k\Omega$, $R_6 = 330\Omega$, $R_7 = 560\Omega$,
$R_y = 10k\Omega$ $R_g = 50\Omega$

a) Determine the value of the R_2 in order to obtain $V_0 = 0V$. (10)

b) Calculate small signal gain v_o / v_g and input and output impedances r_i and r_o respectively. (30)

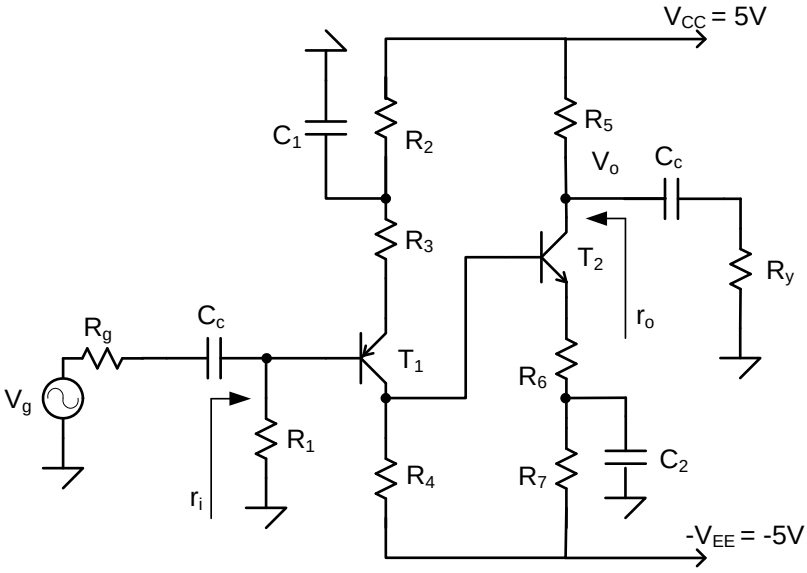

Figure 2

c) For $v_g = 10mV$ peak to peak sine wave, sketch output voltage V_o as a function of time. (10)

Good Luck !