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

EE 203 – Exam I
Saturday, October 15, 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 full wave rectifier circuit shown in Figure 1.

a) Find the value of the capacitance and the required secondary peak voltage V_1 required for the full-wave rectifier circuit to produce an average DC output voltage of + 9.7V with ripple of ± 0.6V. Assume the diode drop is 0.7V (neglect the diode resistance) and the operating frequency is 60Hz. **[6 points]**

b) Find the transformer turns ratio N (between the primary coil and half of the secondary coil) assuming that the input voltage v_s has a peak amplitude of 110V. **[2 points]**

c) Sketch V_1 and V_o as a function of time (**for at least two periods**) and show the important values **[5 points]**

d) Find the diode peak inverse voltage **[3 points]**

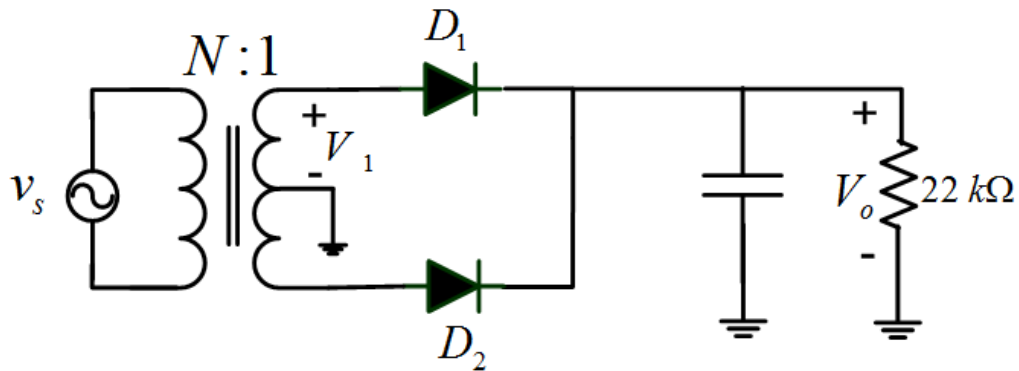e) Modify the circuit to produce –9.7V average DC output **[4 points]**

Figure 1

Question 2:

For the circuit shown in Figure 2. The input voltage is $V_{in}=5\cos(\omega t+\theta)$. The diode D_1 is ideal and each of the diodes D_2 and D_3 has a constant voltage drop of 0.7V when conducting.

a) Find the expressions of the voltage V_{out} as a function of the input voltage V_{in} for V_{in} varying between –5V and +5V. **[8 points]**

b) Sketch the voltage V_{out} as a function of the input voltage V_{in} for V_{in} varying between –5V and +5V and show all important values. **[6 points]**

c) Sketch the voltages V_{in} and V_{out} as a function of time (**for at least one period**) and show all the important values. **[6 points]**
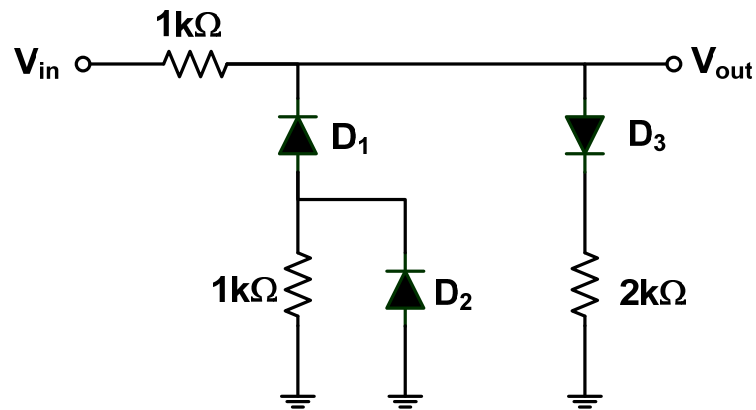

Figure 2

Question 3:
For the circuit shown in Figure 3. The transistors are identical. The parameters of each of them
are $V_t=1V$, $k'_n \dfrac{W}{L} = 2 \ mA/V^2$ and $\lambda = 0$ (channel modulation is neglected).

a) Assuming that both transistors are operating in saturation (pinch off), find the values of the
voltages V_1 and V_2. **[12 points]**
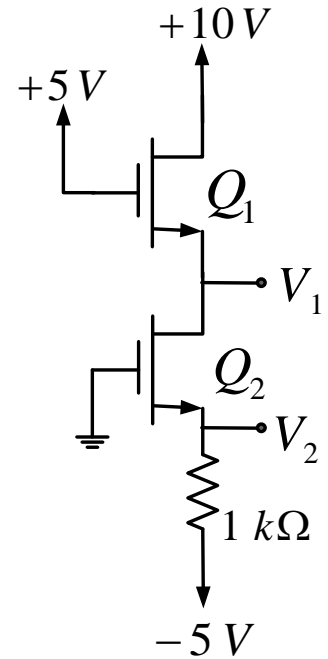
b) Verify the operating mode of each transistor. **[8 points]**

Figure 3