King Fahd University of Petroleum & Minerals
Electrical Engineering Department
Winter 2012 (112)

EE 203 – Exam I
Saturday, March 3, 2012
6:00-7:30 PM

Name	
ID	

	Dr. M. Al-Gahtani	Dr. H. Al-Zaher	Dr. O. Hammi	Dr. W. Mesbah	Dr. H. Ragheb
Section	3 and 6	5	1, 4 and 8	7	2

Problem	Grade
1 (6 points)	
2 (6 points)	
3 (6 points)	
4 (6 points)	
5 (6 points)	
Total (30 points)	

Question 1:

For the circuit shown in Figure 1, the op amp is ideal.

a) Find the range of values of σ for which the closed loop gain is such that $|G| \leq 20$ V/V. Where the close loop gain is given by ($G=v_o/v_{in}$) **[2 points]**

b) For $v_{in}=0.5\sin(1000t)$V, find the maximum output current i_0 when $\sigma =0.1$. **[3 points]**
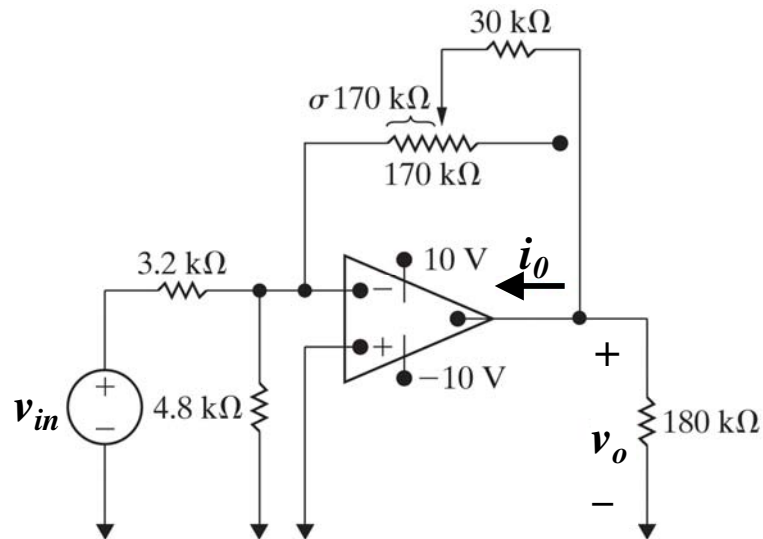
c) Determine the input resistance. **[1 points]**

Figure 1

Question 2:
For the circuit shown in Figure 2, assume that all diodes have a constant voltage drop model with V_D=0.7 V. Calculate I and V_a , and determine the mode of operation of each diode (ON or OFF) in the following cases: **(Verify your Solution)**   **[6 points]**
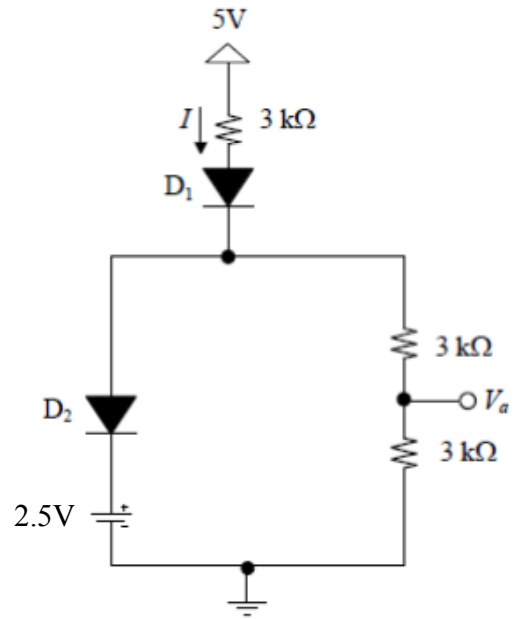

Figure 2

Question 3:
A 10-V Zener diode is used to regulate the voltage across a variable load resistor as shown in Figure 3. The input voltage varies between 13 and 16 V. The load current varies from 0 to 85 mA. The minimum Zener current is 15 mA.
a) Calculate the maximum value of R. **[3 points]**
b) Calculate the maximum power dissipated by the diode for $R=40\Omega$. **[3 points]**

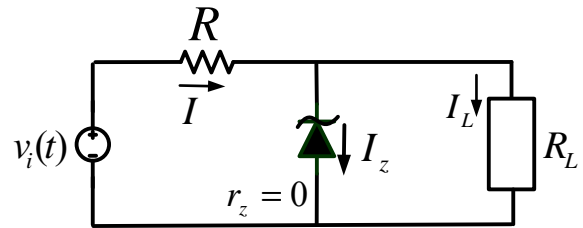$$R \qquad I \qquad v_i(t) \qquad r_z = 0 \qquad I_z \qquad I_L \qquad R_L$$

Figure 3

Question 4:

The rectifier circuit shown in Figure 4 is designed to deliver 30 volt DC to 100 Ω load with ripple voltage equal to 8% of the DC voltage

a) Specify the value of n.   **[3 points]**

b) Specify the value of C.   **[3 points]**
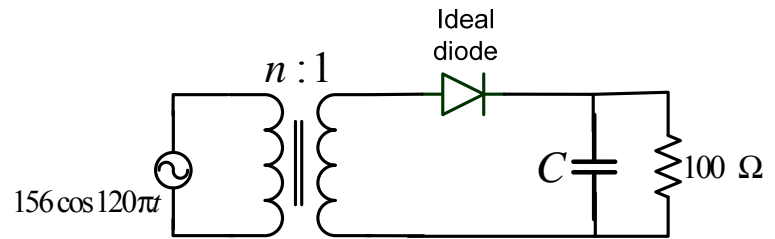

Figure 4

Question 5:

Draw the voltage transfer characteristics (**and show all key values**) for the circuit shown in Figure 5, assume the diodes are identical and have a constant voltage drop model with $V_D = 0.6$ V .   **[6 points]**
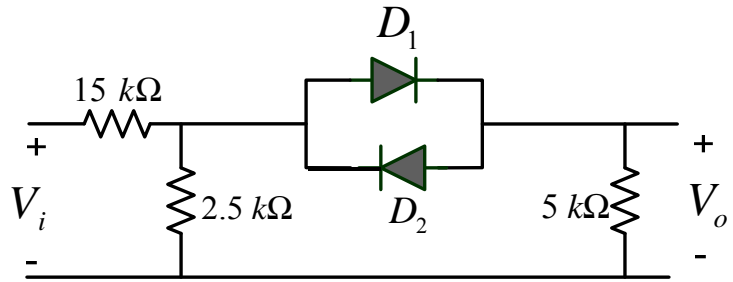
D_1

15 $k\Omega$

+

V_i 2.5 $k\Omega$ D_2 5 $k\Omega$ V_o

-   +

-

Figure 5