



# United International University

## Department of Computer Science and Engineering

EEE 2123: Electronics

Mid-Term Exam: Summer 2022    Time: 1 hour 45 minutes    Marks: 30

*There are four questions here. Answer all of them*

1. Assume that a diode has a turn-on voltage of  $2.1\text{ V}$  and a breakdown voltage of  $4\text{ V}$ . The reverse saturation current and operating temperature of the diode are  $10\text{ nA}$  and  $25^\circ\text{C}$  respectively.



Figure 1: Figure for Q-1

- (a) Fill up the following table based on the given information: [3]

Case	$V_a$	$V_b$	Biasing type	ON/OFF/Breakdown
1	10	5		
2	5	10		
3	-5	2		
4	-3	-5		

- (b) For Case 1, calculate the diode current with appropriate unit. [1]
- (c) What will be the effect on the turn on voltage and the reverse saturation current if the temperature is increased to  $75^\circ\text{C}$ ? [2]

2. Consider the following rectifier circuit where  $I_{0,avg} = 5\text{ mA}$ .

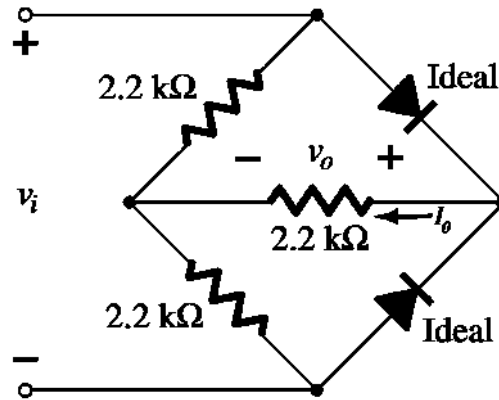


Figure 2: Circuit diagram for Q-2

- (a) Express  $v_0$  in terms of  $v_i$ . [2]
- (b) Find the maximum value and average values of  $v_0$ . Hints: Ohms law relates  $v_0$  and  $i_0$ . [2]
- (c) Sketch  $v_0$  and  $v_i$  in the same plot mentioning peak values. [1]
- (d) Calculate PIV of any diode given in the above network. [1]

3. (a) Design the clipper and clamper circuit to produce the following output voltage ( $V_o$ ) according to the given input voltage ( $V_i$ ). Assume the diodes to be ideal. Hints: Try to achieve a signal with 3 V to -7 V peak values at the end of the clipper network. [5]

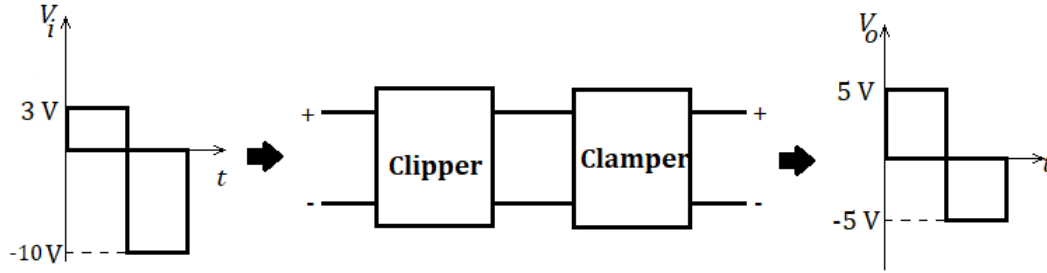


Figure 3: Circuit diagram for Q-3(a)

- (b) Sketch the output voltage of the following circuit assuming *GaAs* diode and properly mention the output voltage levels. The r.m.s (root mean square) value of the input voltage is 10 V. [4]

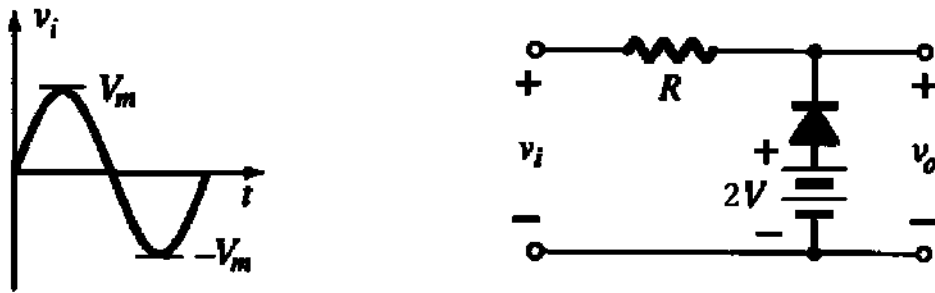


Figure 4: Circuit diagram for Q-3(b)

4. (a) Solve the following circuit to find the values of  $I_1, I_2, I_3, I_4, I_0$  and  $V_0$ . [6]

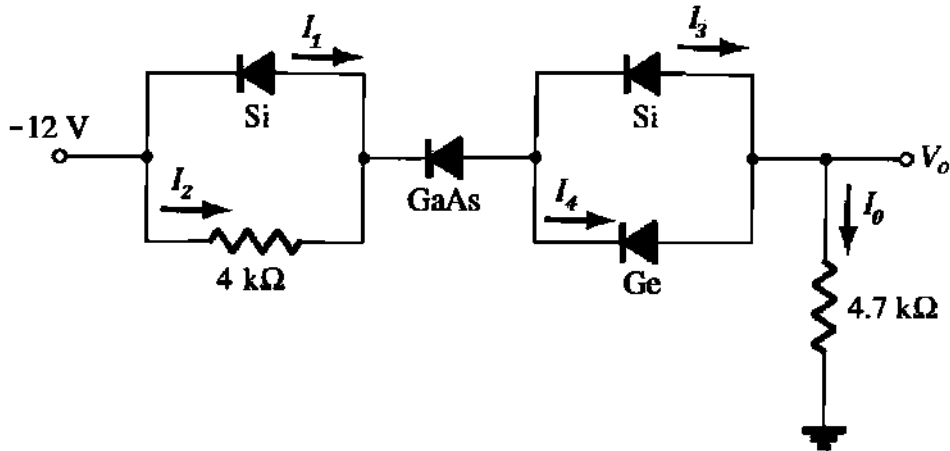


Figure 5: Circuit diagram for Q-4(a)

Question-4 continued....

(b) Find the values of  $I_1$ ,  $I_2$ ,  $I_0$  and  $V_0$  in the following network.

[3]

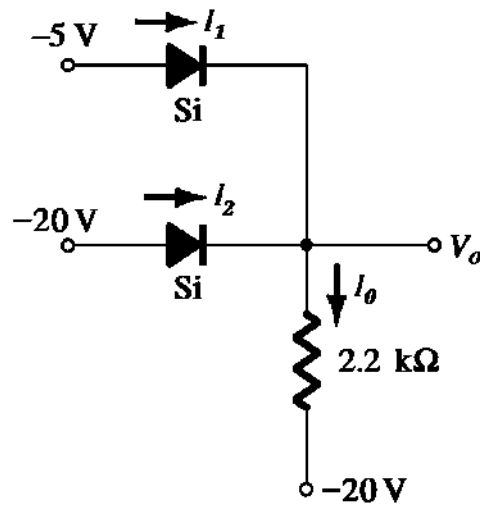


Figure 6: Circuit diagram for Q-4(b)