XMUT204 Electronic Design

Laboratory 2: Diode Characteristics – Questions

Due Date: You need to submit a report to XMUT Co-teacher; please check with him how and when to submit.

1. Show your plots of measured diode current and voltage for the forward bias and reverse bias regions. From these graphs determine:

   a. The voltage drop over the diode in forward bias. [10 marks]
   b. The resistance of the diode when on. [10 marks]
   c. The reverse bias current that flow at –5 V. [10 marks]

2. The factor n that appears as part of the Ebers-Moll equation is termed the diode constant and should have a value between 1 and 2. Suggest how the value of n can be graphically determined from your experimental I-V data. [Hint: What approximation can be made and what graph should be plotted to easily yield the value of n. Determine this value of n for your diode]. [10 marks]

3. From your load line method determine the current through the diode and the voltage drop over the diode at the operating point of the circuit. Compare to the measured values. [10 marks]

4. You must use a diode in a circuit which is supplied by a 3.3 V voltage source. You need to place a current limiting resistor in series with the diode to ensure that a current of no more than 5 mA flows through the circuit. Calculate the value of the resistor you will use in this circuit. [10 marks]

5. Discuss the observed trends in the diode parameters with temperature using your knowledge of semiconductors and the device physics of a p-n junction. [10 marks]

6. For the given rectifier circuit:
   a. Describe the operation of half-wave rectifier circuit. [10 marks]
   b. Describe the operation of bridge rectifier circuit [10 marks]

7. Describe two differences i.e. efficiency and stability of the supply power of half-wave rectifier with bridge rectifier. [10 marks]

Marking Schedule

Student Name : _____

Student ID : _____

No	Section	Mark	Your Mark	Remarks
	Questions			
1	Show your plots of measured diode current and voltage for the forward bias and reverse bias regions. From these graphs determine:			
	• The voltage drop over the diode in forward bias.	10		
	• The resistance of the diode when on.	10		
	• The reverse bias current that flow at –5 V.	10		
2	The factor n that appears as part of the Ebers-Moll equation is termed the diode constant and should have a value between 1 and 2. Suggest how the value of n can be graphically determined from your experimental I-V data. [Hint: What approximation can be made and what graph should be plotted to easily yield the value of n. Determine this value of n for your diode].	10		
3	From your load line method, determine the current through the diode and the voltage drop over the diode at the operating point of the circuit. Compare to the measured values.	10		
4	You must use a diode in a circuit which is supplied by a 3.3 V voltage source. You need to place a current limiting resistor in series with the diode to ensure that a current of no more than 5 mA flows through the circuit. Calculate the value of the resistor you will use in this circuit.	10		
5	Discuss the observed trends in the diode parameters with temperature using your knowledge of semiconductors and the device physics of a p-n junction.	10		
6	For the given rectifier circuit:			

	• Describe the operation of half-wave rectifier circuit.	10		
	• Describe the operation of bridge rectifier circuit.	10		
7	Describe two differences i.e. efficiency and stability of the supply power of half-wave rectifier with bridge rectifier.	10		
	Total	100		

Comment: