**Studio 1 Workbook Section – Diodes**

This section should be submitted as part of your Workbook. Working should be shown.

Student Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Student Number: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Hand Calculations**

**Part 1**

Determine the reverse saturation current for the diode below, given that , produces a diode current of . Use and .

Calculate the diode voltage () for diode currents () of , and . Fill your values in the table below. Use the values in the table to plot the diode characteristic and use a load line to graphically determine the quiescent diode current (), quiescent diode voltage (), and incremental resistance () at the operating point.

A close up of a clock

Description automatically generated

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | 1 | 5 | 10 | 20 |
|  |  |  |  |  |

Include your plot here, or attach graph (graph paper provided):

**Part 2**

Use the quiescent diode current (), obtained in Part 1 to theoretically calculate the incremental resistance () at the operating point.

**Computer Simulation**

**Part 1**

Using LTSpice, model the full wave centre tapped rectifier below, and demonstrate its operation. Use an appropriate diode model. Choose appropriate values for the inductors, and you may assume no leakage inductance for your simulation. Include the input and output voltage waveforms as well as a screenshot of your circuit. Label important features on your graph.

Note: You will need to research how to implement the centre tapped rectifier in LTSpice. Some links to assist with this have been provided on Blackboard.

A picture containing clock

Description automatically generated

Use the following values:

$, where is the last digit of your student number

**Part 2**

Using LTSpice, model the Zener diode circuit below. Use the provided diode model in bzx55c5v1.txt.

Note: Some links to assist with using a .subckt model in LTSpice have been provided on Blackboard.

A picture containing object

Description automatically generated

BZX55C5V1

1. Plot versus for
2. At what value of does the circuit start behaving like a regulator?
3. Estimate the Line Regulation from the plot of versus .
4. Plot versus , and use this to estimate the Load Regulation .