VE311 Electronic Circuit Lab 1 Manual
Due: **Jun 8th 11:59 a.m.**

1 Objectives

- Familiar with the experiment equipment like breadboard and oscilloscope.
- Learn about the properties of diodes.
- Learn about the basic concept of rectifiers. such as V_{dc}, I_{dc}, θ_c, ΔT, I_{peak}, I_{surge} and PIV.

2 Exercises

2.1 Voltage Regulator

Build the voltage regulator below in Proteus and on the breadboard.

1. For $V_s = 5V$, $R = 100\Omega$ and $R_L = \infty$, use a voltage meter to obtain the value of V_L.

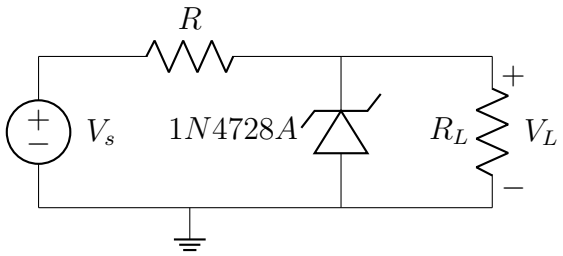
   Discussion: Whether the obtained V_L is reasonable, in comparison to the V_Z in the 1N4728A datasheet?

2. For $V_s = 5 + 0.5\sin(120\pi t)$, $R = 100\Omega$ and $R_L = \infty$, display both V_S and V_L on the oscilloscope. Estimate the line regulation by comparing the amplitudes of V_S and V_L. By using the equation: line regulation= $R_Z/(R + R_Z)$, estimate the value of R_Z.

   Discussion: If $V_s = 2 + 3\sin(120\pi t)$, how will V_L change?

3. For $V_s = 5V$ and $R = 100\Omega$, by gradually decreasing R_L, find out the minimum $R_{L,min}$, below which the voltage regulator stops working. You can assume the Zener diode will stop working at $V_L = 2V$.

   Discussion: How to modify the voltage regulator so that $R_{L,min}$ becomes 2 times smaller?

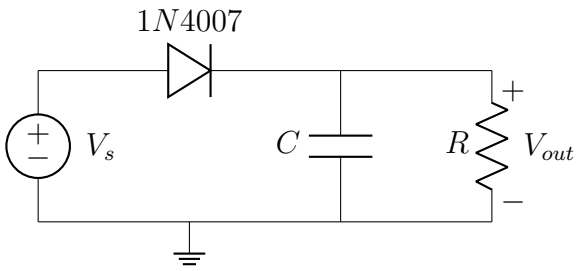


2.2 Half-Wave Rectifier

Build the half-wave rectifier circuit below in Proteus and on the breadboard.

1. For $V_s = 5sin(120\pi t)$ and $R = 1k\Omega$, find out the value of C so that the ripple voltage is smaller than 0.1 V. Display V_{out} on the oscilloscope to confirm V_r is indeed smaller than 0.1 V and estimate V_{dc}, I_{dc}, θ_c, ΔT, I_{peak}, I_{surge} and PIV based on the waveforms. Ensure the half-wave rectifier is reliable, that is I_{peak},I_{surge}, and PIV lower than the maximum ratings from the 1N4007 datasheet.

   Discussion: How will V_r change, if $V_s = 5sin(240\pi t)$?



3 Deliverables and Grading

- Lab Attendance [10%]

  Students are required to attend the lab. Any unexcused absence will result in a grade of zero for the missed lab and the student has the responsibility of contacting the instructor or TA in advance.

- Lab Demonstration [4*5%]

  Students should successfully demonstrate a working circuit of each exercise to TA before their lab session ends or come to the free lab session and send the demonstration video to TA.

- Lab Report [70%]

  A lab report should include objectives, Experimental results (numerical results, figures), Simulation results (also the Proteus file), Error analysis, discussion, and Conclusion. Everyone needs to submit the Proteus file and report individually.