General Sir John Kotelawala Defense University
Faculty of Computing
Department of Computer Engineering

2.1

BSc (Hons) in Computer Engineering
Laboratory Practical
ET1102- Basic Electronics

Experiment #1 Design of a Simple Zener Regulated DC Power Supply

Name:
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Index No
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Intake
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Date
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Instructor Name and Signature:
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Comments ……

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Grade

Objectives:
(a) Testing of Diodes
(b) Full Wave Rectifier
(c) Capacitor Filter
(d) Zener Regulator
(e) Hard-wired simple zener regulated 5 V dc power supply

Equipment required:

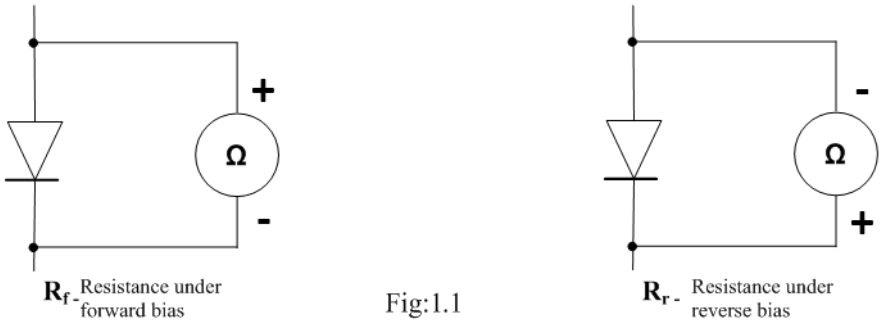
5V/50Hz ac source
Oscilloscope
Multimeter
Protoboard

Components required :

Diode IN4001
Zener Diode (Vz=4.7V)
Bridge Rectifier,IC
Capacitors 4.7µf,220µf(1 of each)
Resistors 1K,10K,100K (1 of each)

(a) Testing of Diodes

The resistance of a forward biased diode, $\mathbf{R_f}$, is low and the resistance of a reversed biased diode $\mathbf{R_r}$ is high.By observing the resistance of the diode, $\mathbf{R_f}$ and $\mathbf{R_r}$ it is possible to test a diode and determine whether it is working or not.
Use the multimeter as an ohmmeter as shown in Fig:1.1 and observe $\mathbf{R_f}$ and $\mathbf{R_r}$ by fixing a diode on the protoboard.



$\mathbf{R_f}$ - Resistance under forward bias

Fig:1.1

$\mathbf{R_r}$ - Resistance under reverse bias

Is the diode working or not working?.....

(b) Bridge Rectifier

The Bridge rectifier in fig: 1.2 is a full wave rectifier. It converts ac to dc. The ac input is applied across A and B while the dc output is taken across P and Q.

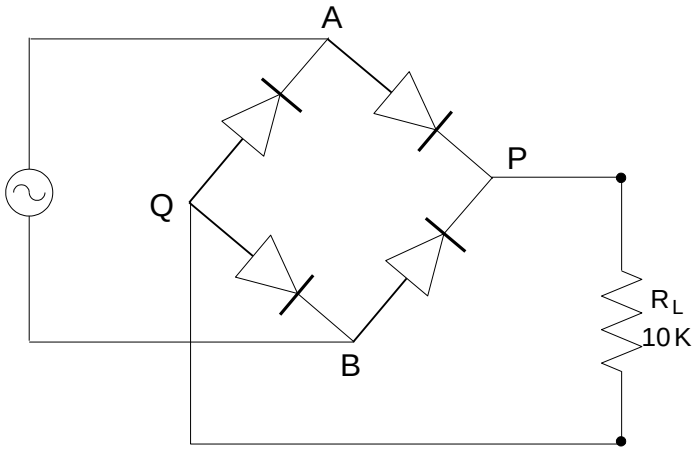


Fig:1.2

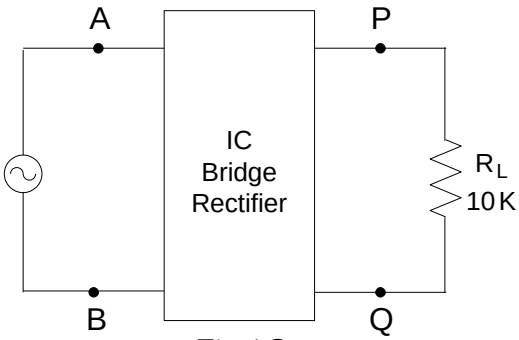
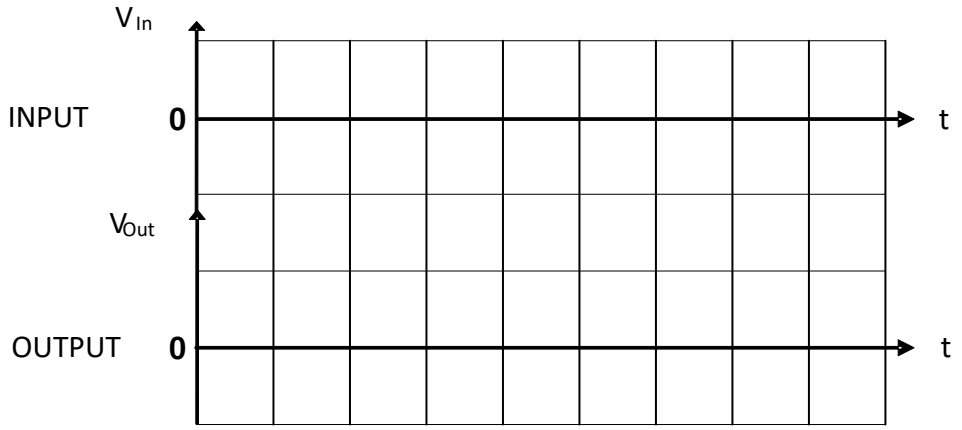


Fig:1.3

The bridge rectifier is available in IC form as shown in Fig : 1.3

- Fix the IC on the protoboard and apply a 5V/50Hz voltage across the input terminals ABof the IC.
- Connect a 10K load resistor across the output terminals PQ.
- Observe the ac input voltage across AB on the oscilloscope and draw the waveform in the box given below.
- Observe the dc output voltage across PQ on the oscilloscope and draw the waveform in the box given below.



Use the multimeter and measure the dc voltage of the output.

$V_{out}= V_{dc}$=……

Measure V_{max} of the waveform on the oscilloscope and estimate V_{dc} using the expression

$V_{dc}=(2/\pi).V_{max}$ =……..

(c) Capacitor Filter

The output from the rectifier is a changing dc voltage; it is not a true dc. It is a almost always necessary to have steady dc voltages to get electronic circuits to function properly. A number of different smoothing circuits or filter circuits are used to produce a steady dc from a rectifier output. The simplest such filter circuit is the capacitor filter.

- Connect the 4.7µf capacitor across the output of the rectifier as shown in Fig : 1.4

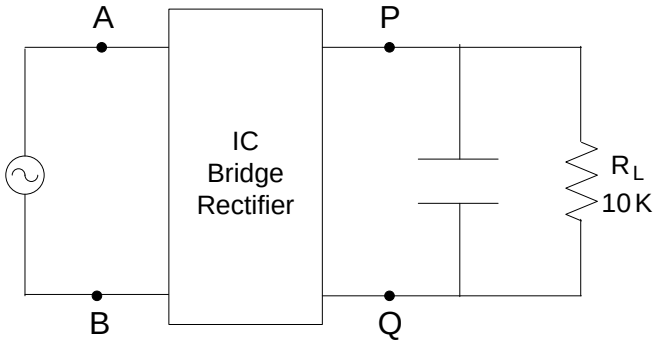
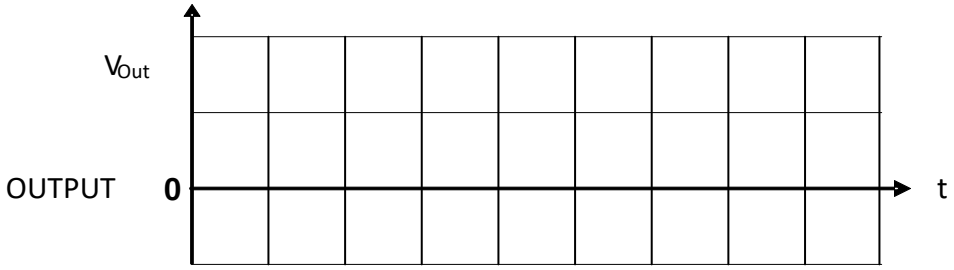


Fig:1.4 **C = C1= 4.7µF ; C = C2 = 220 µF**

- Observe the output voltage across the load resistor on the oscilloscope and draw the waveform in the box given below.

- Replace the 4.7µf capacitor with the 220µf capacitor and observe the output voltage waveform on the oscilloscope and draw the waveform on the same box given below as before.



- Make a comment on your observations of the effect of the capacitor filter.

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(d) Zener Regulator

The dc output voltage after the capacitor filter is smooth. However it would vary if the load resistor varies.Hence the dc output voltage has to be stabilized. A simple zener regulator can produce a reasonably good stable dc output.

Connect the zener diode and a series resistor as shown in the circuit in Fig: 1.5 such that the output dc voltage is made stable or regulated.

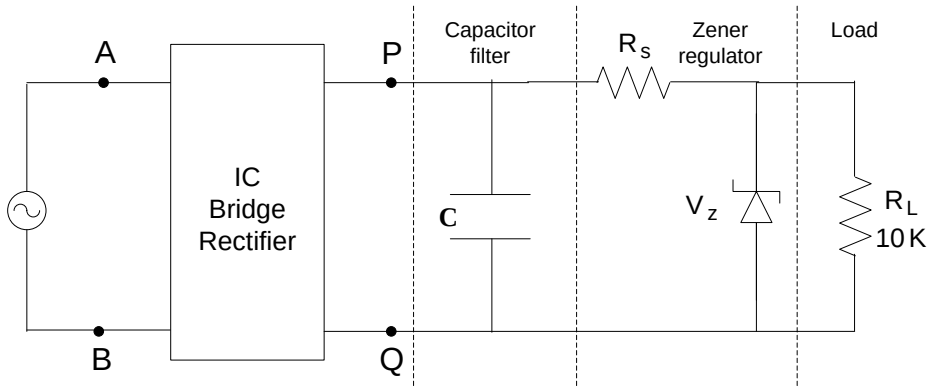

Fig:1.5 **C = C2 = 220 µF ; V_Z = 4.7V ; R_S = 1K ; R_L = 10K**

- Observe the dc output across the load resistor on the oscilloscope.

  V_{ou}=…… from the oscilloscope

  V_{out}=…….. from the multimeter

- Change the load resistor R_L to 100K and obtain V_{out}.

  V_{out}=……... from the multimeter

- Change the load resistor R_L to 1K and obtain V_{out}.

V_{out}=…… from the multimeter

- Make a comment on the dc output voltage as R_L is changed.

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Performance Evaluation

Experiment: Design of a Simple Zener Regulated DC Power Supply

	Evaluation Aspect	Marks
1	Preparation	
2	Neatness of Work	
3	Familiarity with Lab Equipment	
4	Completion of Work	
5	Capability	
6	Accuracy of Readings/ Observations	
7	Answers given to Questions	
8	Discipline	
	Total	

Marks are awarded on a 0-10 scale for each aspect

Excellent	Very Good	Good	Fair	Poor	Very Poor
10	9 – 8	7 – 6	5 – 4	3 – 2	1 – 0

Name of the Instructor: ……

Signature: …….

Date: …….