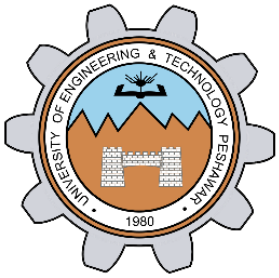
Lab Report : 08



Spring 2020

Electronic Devices and Circuit Theory

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Section: **B**

Submitted to:

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24th July, 2020.

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Zener Diode Characteristics

Objectives:

1) To study the characteristics of Zener diode.
2) To study the voltage regulation in Zener diode regulation circuit.

Equipment:

- Digital Multimeter (DMM)

Components

- Zener-Diode: Silicon (1N742A)
- Resistors: 1KΩ,10KΩ,1MΩ
- Variable Voltage Source

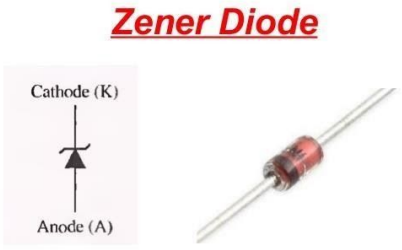
Theory:

Diode:

A diode is a two-terminal electronic component that conducts current primarily in one direction; it has low resistance in one direction, and high resistance in the other.

Zener diode

Zener diode is a P-N junction diode specially designe t
is acting as normal diode while forward biasing. It has ı
voltage, at which the diode breakdowns while revers :
diode damages at the break down voltage. But zener d :
reverse breakdown region.



The basic principle of zener diode is the zener breakdown. When a diode is heavily doped, it's depletion region will be narrow. When a high reverse voltage is applied across the junction, there will be a very strong electric field at the junction. And the electron hole pair generation takes place. Thus heavy current flows. This is known as Zener break down.

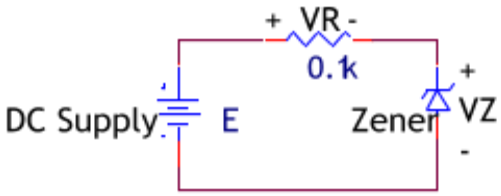
So a zener diode, in a forward biased condition, acts as a normal diode. In reverse biased mode, after the breakdown of junction current through the diode increases sharply. But the voltage across it remains constant.

Procedure:

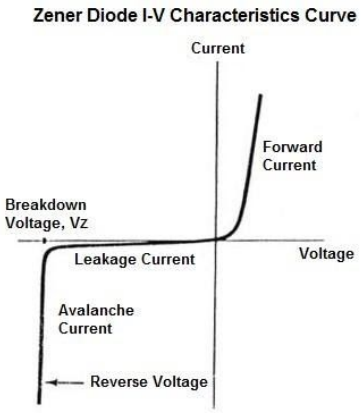
Part A: Zener Diode Characteristics

Construct the circuit of *Fig. 1*. Set the DC supply to 0 V and record the measured value of R.

Circuit Diagram :

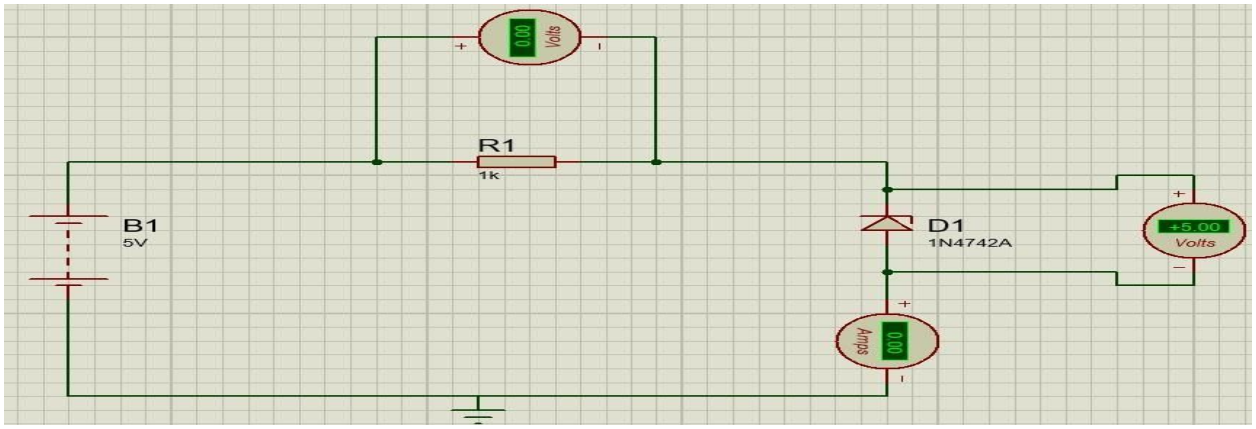


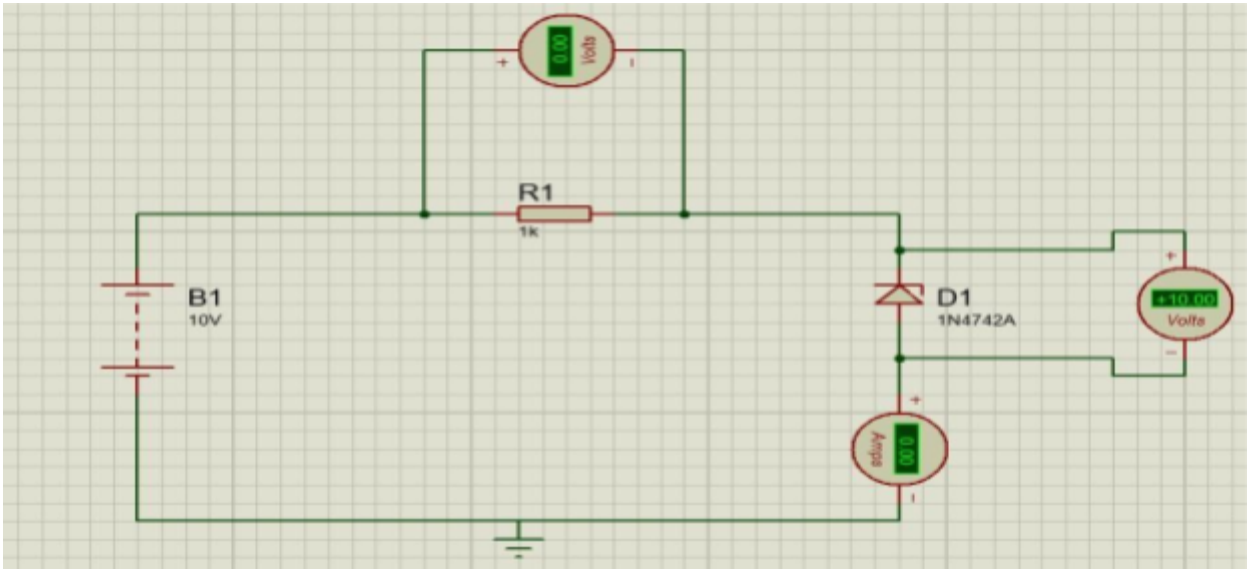
Zener Charactersitic Curve :

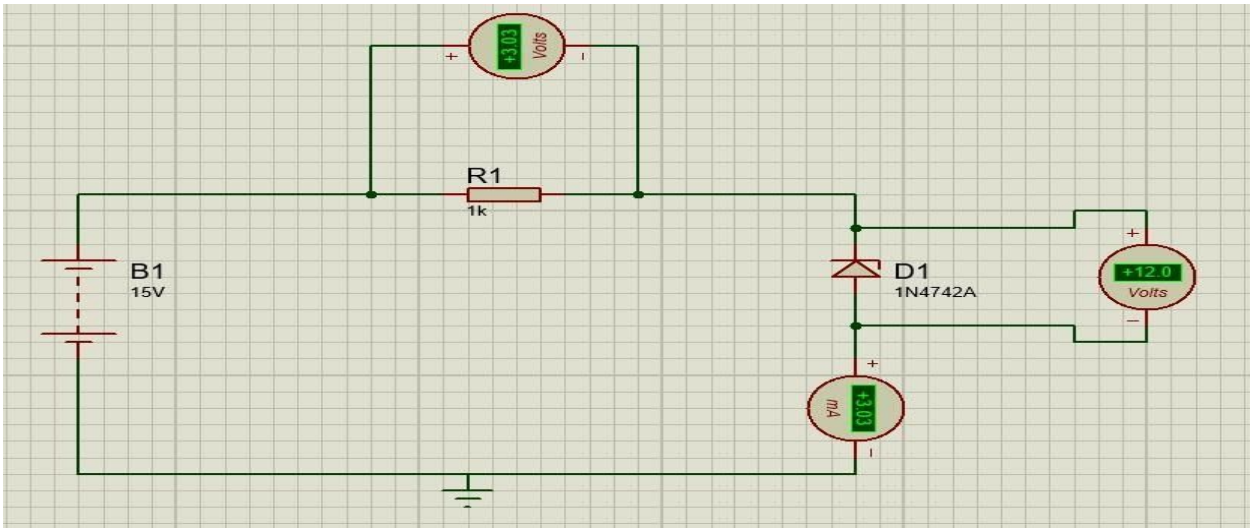


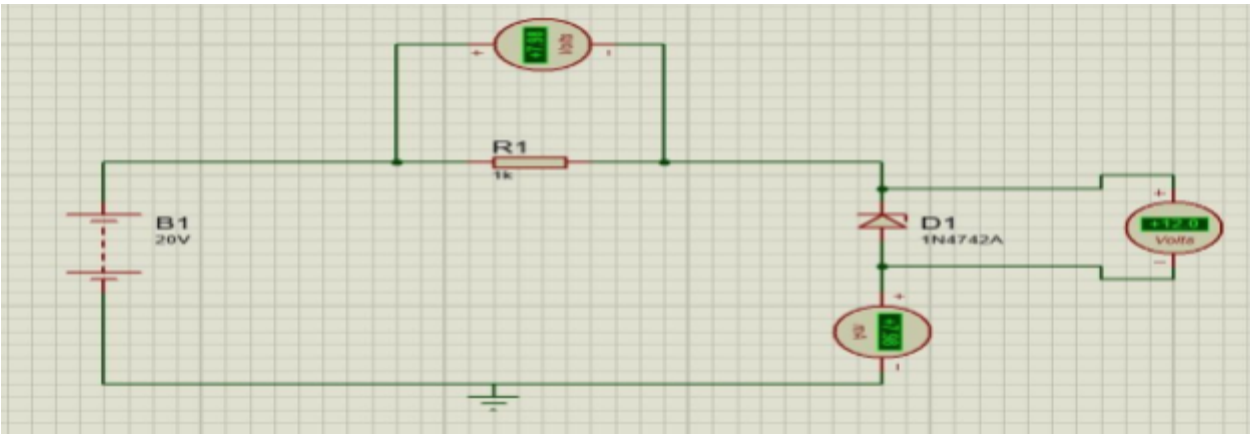
Set the DC supply (E) to the values appearing in Table 4.1 and measure both V_Z and V_R. Calculate the Zener current, I_Z using the Ohm's law given in the table and complete the table.

Circuit Diagram:


0.00
Volts
R1
1k
B1
5V
D1
1N4742A
+5.00
Volts
Amps
0.00


0.00
Volts
R1
1k
B1
10V
D1
1N4742A
+10.00
Volts
Amps
0.00


+3.03
Volts
R1
1k
B1
15V
D1
1N4742A
+12.0
Volts
mA
+3.03

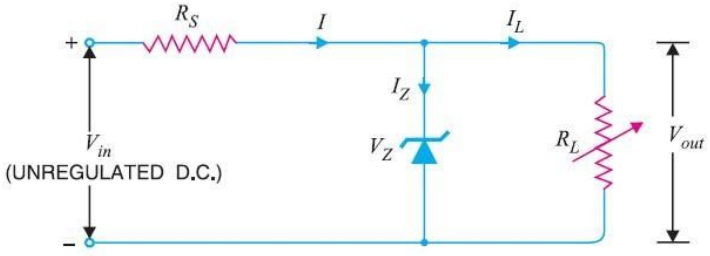


Observations:

S/no	Vcc	Vs(Across Resistor)	Vz	Iz
1	5V	0V	5V	0mA
2	10V	0V	10V	0 mA
3	15V	3.3V	12V	3.03 mA
4	20V	7.98V	12V	7.98 mA

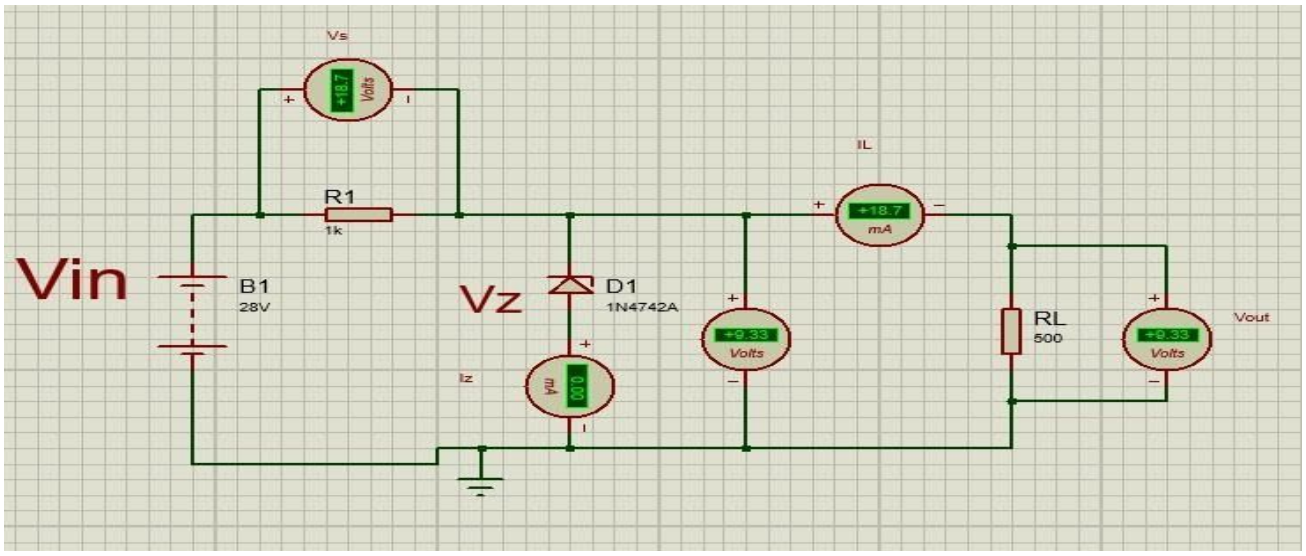
Part B As A Regulator

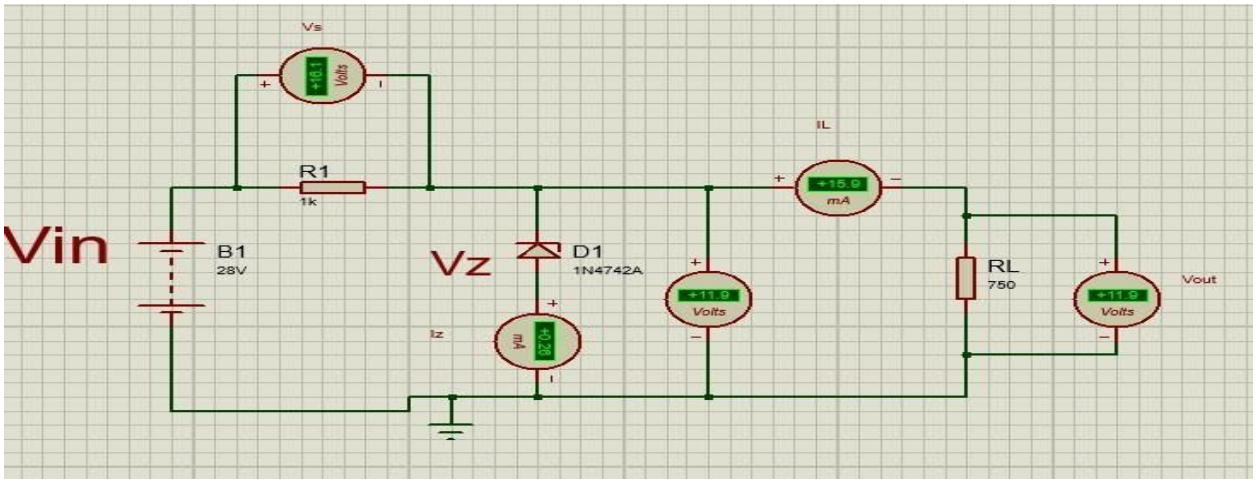
Construct the circuit of *Fig. 2*. Record the measured value of each resistor.

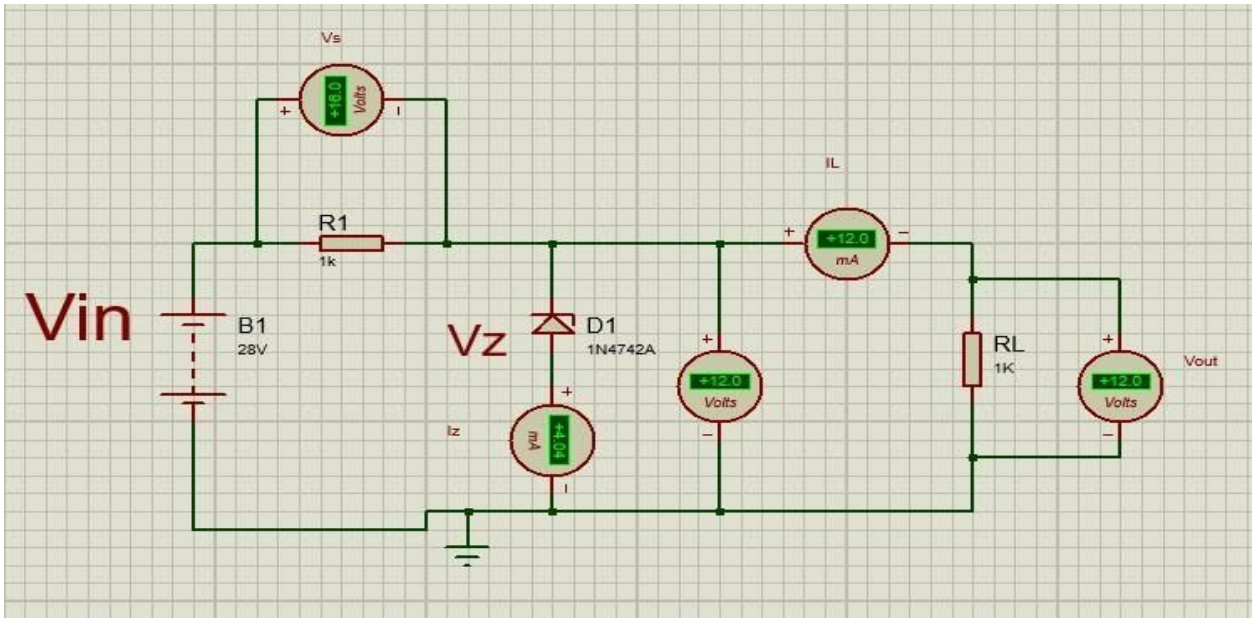


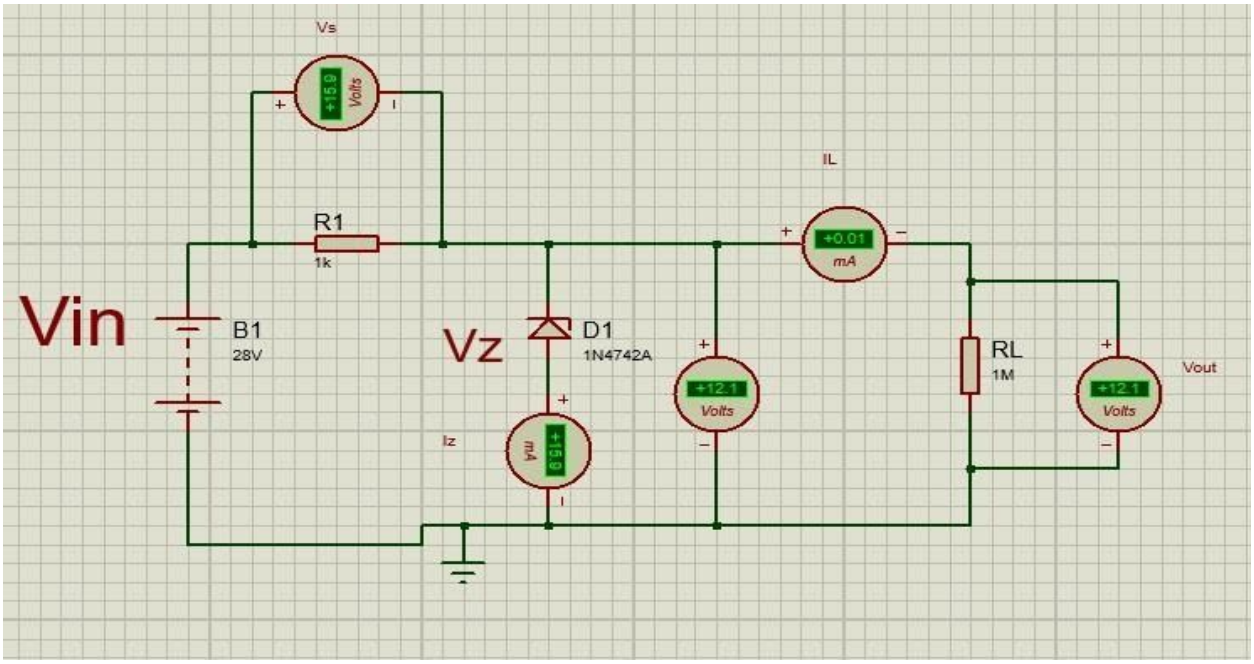
Measure the value of V_L and V_R. Using the measured values, calculate the Value for current across R, I_R, current across R_L, I_L, and current across the Zener Diode, I_Z.

Circuit Diagram:


Vs
+18.7
Volts
R1
1k
IL
+18.7
mA
Vin
B1
28V
Vz
D1
1N4742A
Iz
mA
0.00
+9.33
Volts
RL
500
+9.33
Volts
Vout


Vs
+16.1
Volts
R1
1k
IL
+15.9
mA
Vin
B1
28V
Vz
D1
1N4742A
Iz
mA
+0.28
+11.9
Volts
RL
750
+11.9
Volts
Vout


Vs
+16.0
Volts
R1
1k
IL
+12.0
mA
Vin
B1
28V
Vz
D1
1N4742A
Iz
mA
+4.04
+12.0
Volts
RL
1K
+12.0
Volts
Vout



Observations:

S/No	Vin	Vz	Iz	RL	Vout	Vs
1	28V	9.33v	0.00mA	500_{Ω}	9.33v	18.7v
2	28V	11.9v	0.28mA	750_{Ω}	11.9v	16.1v
3	28V	12v	4.04mA	1k	12v	16v
4	28V	12.1v	15.9mA	$1M_{\Omega}$	12.1v	15.9v

Conclusion:

The Zener diode, with its accurate and specific reverse breakdown voltage, allows for a simple, inexpensive voltage regulator. Combined with the right resistor, fine control over both the voltage and the supply current can be attained.