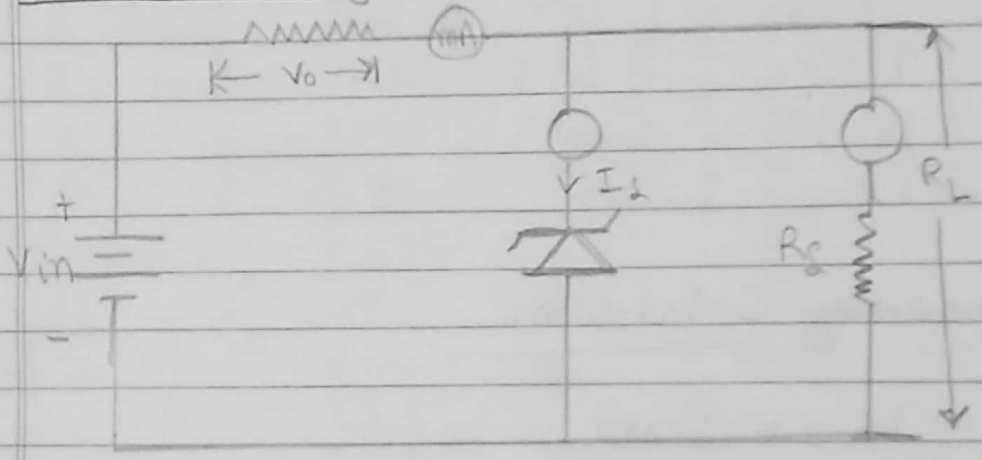
Experiment 2(b)

Zener diode as voltage regulator

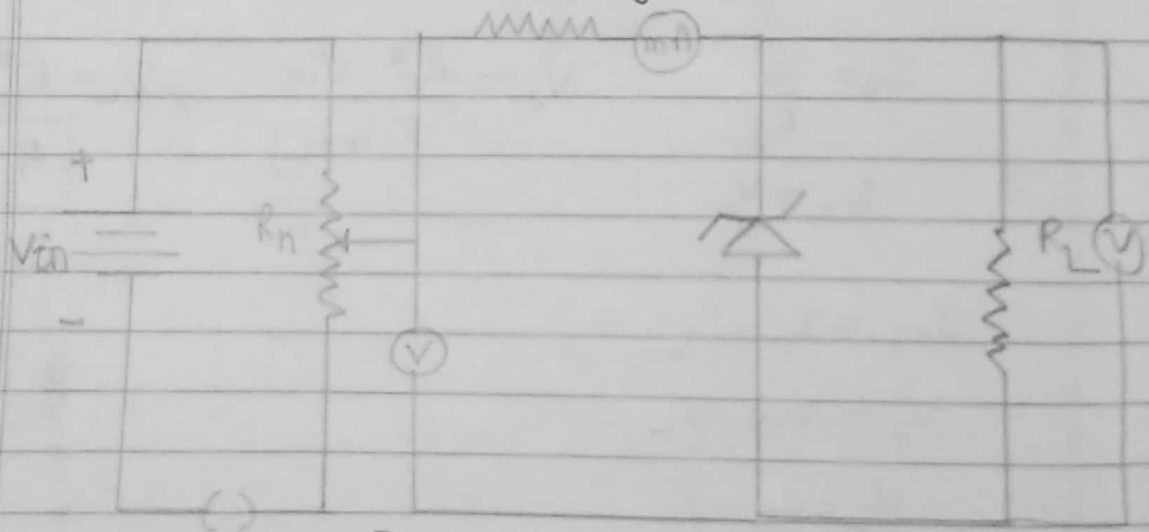
Aim :- To construct a Zener diode voltage regulator and measures its line and load regulation.

Apparatus :- Zener diode, resistor, variable DC power supply, milliammeter, voltmeter, Rheostat and wire.

~~Observation~~ R_S



Zener diode shunt regulator



Setup

Formula used :-

(a) For line Regulation

% of line Regulation $= \frac{\Delta V_o}{\Delta V_{in}} \times 100$

(b) For load regulation

$= \frac{V_{NL} - V_{FL}}{V_{NL}} \times 100$

Observations

Series Resistance = 600Ω

Load Resistance = 17,000Ω

Line regulation

S.No	Vin in V	Vo in V	Rheostat (R_h)
1	0	0	1000
2	1.19	1.15	900
3	2.38	2.29	800
4	3.56	3.43	700
5	4.74	4.57	600
6	5.92	5.59	500
7	7.10	5.596	400
8	8.28	5.597	300
9	9.51	5.598	200
10	10.75	5.599	100
	12	5.6	0

~~Load reg~~ Calculations

$$I_{max} = \frac{\text{Power}}{\text{Zener Voltage}}$$

$$I_S = \frac{V_S}{R_S} \qquad V_S = \frac{R_S * V_{in}}{(R_S + R_L)} \; ; V_L = \frac{R_L * V_{in}}{(R_S + R_L)}$$

$$I_L = \frac{V_L}{R_L}$$

$$I_Z = I_S - I_L$$

$$V_S = V_{in} - V_L$$

$$V_L = V_Z$$

Load Regulation

Observation Table-II

S.No	R_L (Ω)	Vo(V)
1	1000	5.6
2	900	5.6
3	800	5.6
4	700	5.6
5	600	5.6
6	500	5.6
7	400	5.6
8	300	5.6
9	200	4.8
10	100	3
11	0	0

Calculations :-

Results :-

(a) % line Regulation = $\frac{5.6 - 1.177}{12 - 1.19} \times 100 = 40.91$

(b) % load Regulation = $\frac{5.6 - 4.8}{5.6} \times 100 = 14.28$