EEE Digital Assignment (Software)

Zener Diode

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Slot: L11+L12

Batch: 10(B-Tech Computer Science (Core))

ZENER DIODE

AIM:

Design of regulated power supply.

APPARATUS/TOOL REQUIRED:

Apparatus/Tool required:

ORCAD / PSpice simulator -> **Analog Library – R, L & C**
Diode Library - D1N4007 & Zener diode
Source Library – Vac, Vdc &
Ground (GND) – 0 (zero)

Simulation Settings: **Analysis Type - Time Domain**

CIRCUIT DIAGRAM:

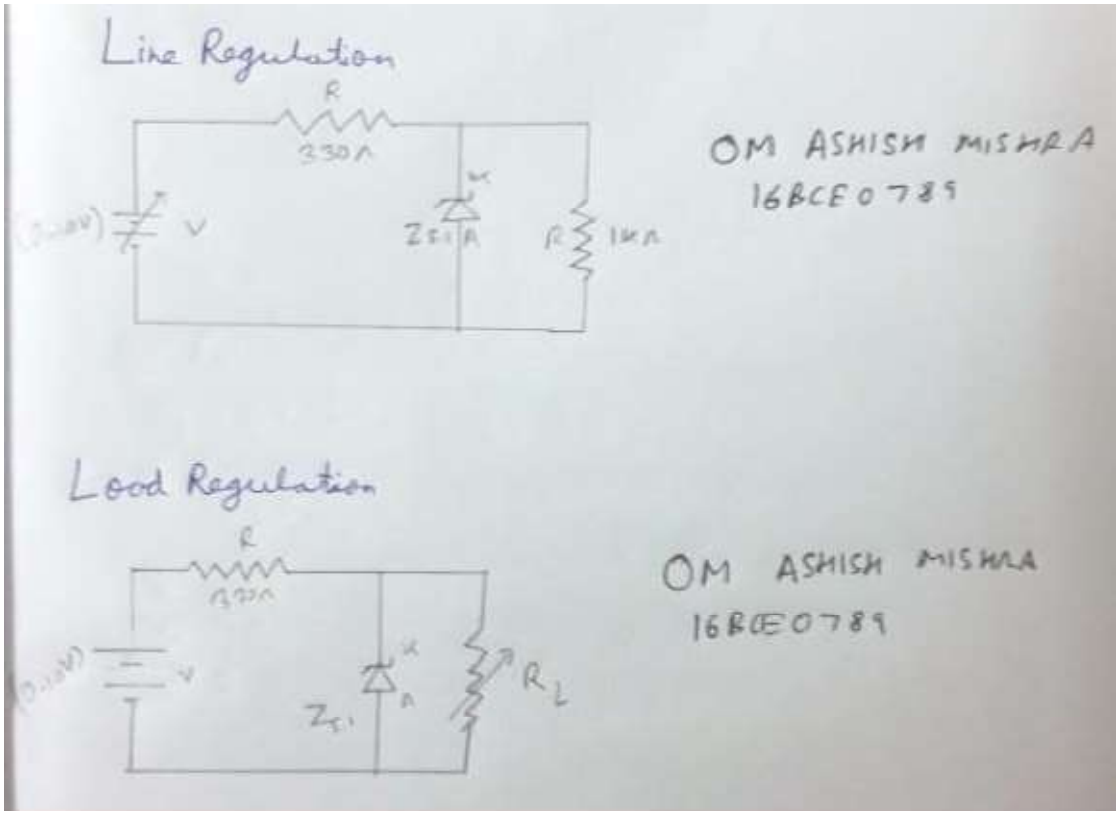


Fig: Line and Load Regulations

THEORY:

A **Zener diode** allows current to flow from its anode to its cathode like a normal semiconductor diode, but it also permits current to flow in the reverse direction when its "Zener voltage" is reached. Zener diodes have a highly doped p-n junction. Normal diodes will also break down with a reverse voltage but the voltage and sharpness of the knee are not as well defined as for a Zener diode. Also normal diodes are not designed to operate in the breakdown region, but Zener diodes can reliably operate in this region.

Zener reverse breakdown is due to electron quantum tunnelling caused by a high strength electric field. However, many diodes described as "Zener" diodes rely instead on avalanche breakdown. Both breakdown types are used in Zener diodes with the Zener effect predominating under 5.6 V and avalanche breakdown above.

Zener diodes are widely used in electronic equipment of all kinds and are one of the basic building blocks of electronic circuits. They are used to generate low power stabilized supply rails from a higher voltage and to provide reference voltages for circuits, especially stabilized power supplies. They are also used to protect circuits from over-voltage, especially electrostatic discharge (ESD).

PROCEDURE:

Step 1: Open Capture CIS

Step 2: Click on the File button

Step 3: Click on New Project

Step 4: Select Blank Project

Step 5: Go to Library

Step 6: Select Analog Library – R, L & C

Step 7: Select Diode Library - D1N4007 & Zener diode

Step 8: Select Source Library – Vac, Vdc &Ground (GND) – 0 (zero)

Step 9: Click on New Simulation

Step 10: Analysis Type - Time Domain

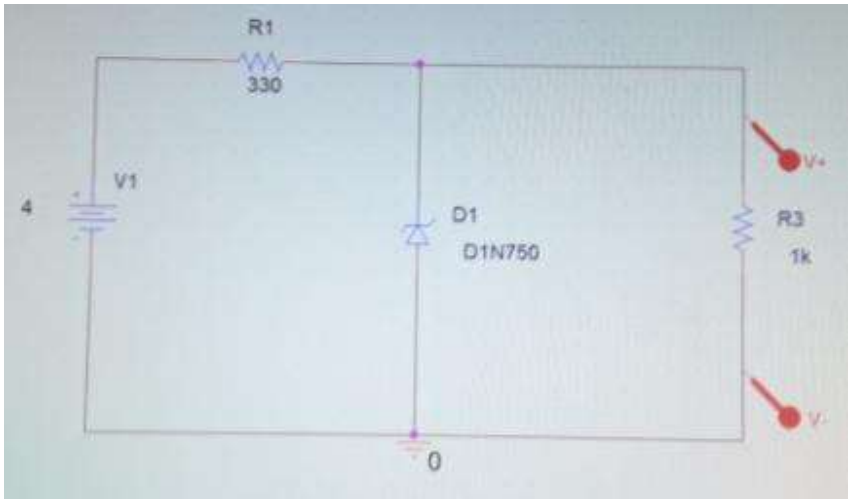
Step 11: Run to time - 40ms (for 2 cycles)

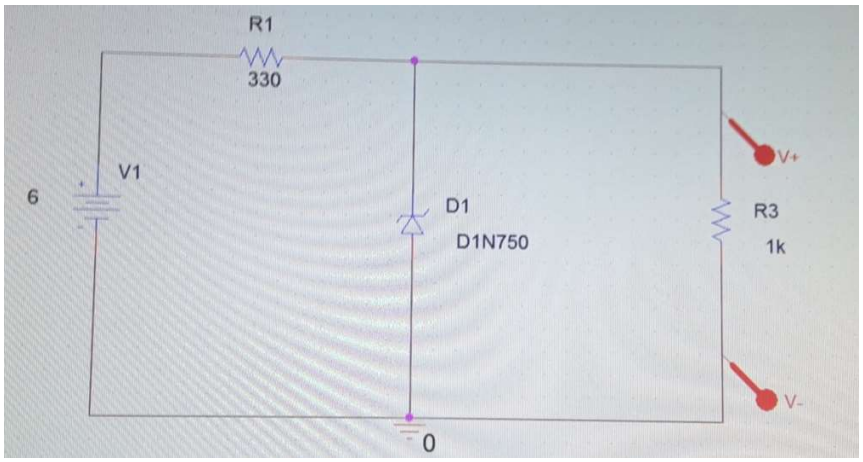
Step 12: Apply it

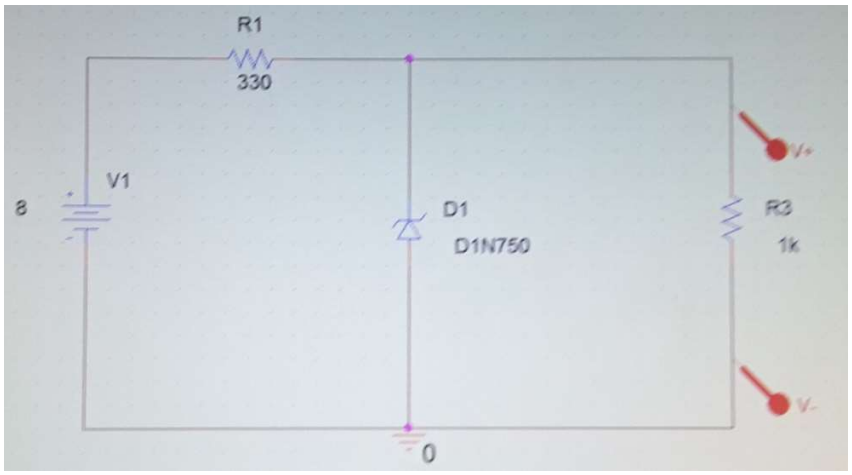
Step 13: Then we run the simulated program

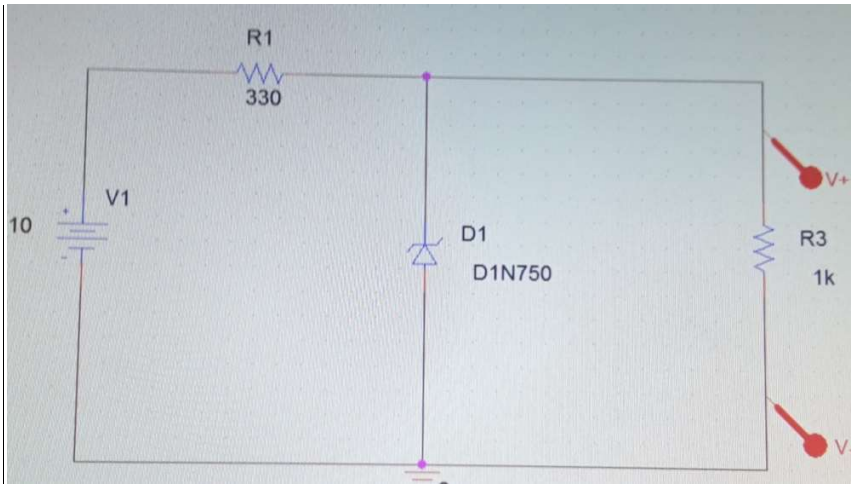
Step 14: Then we get the output.

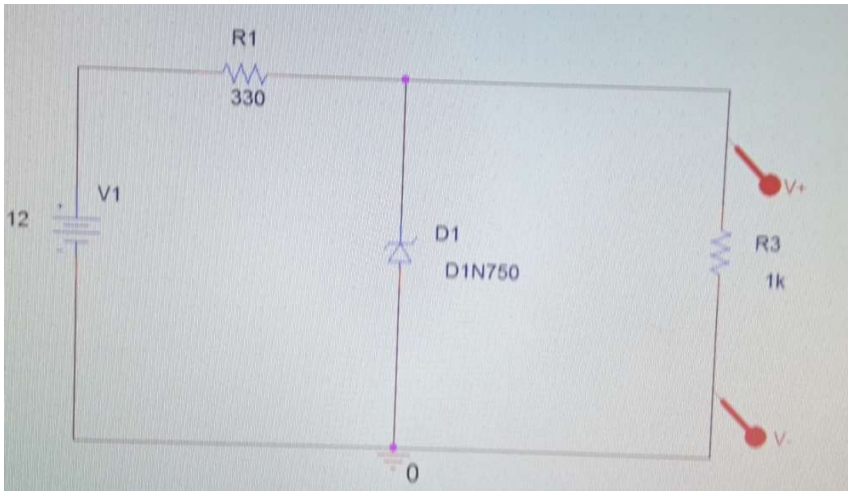
SIMULATION CIRCUIT DIAGRAM:











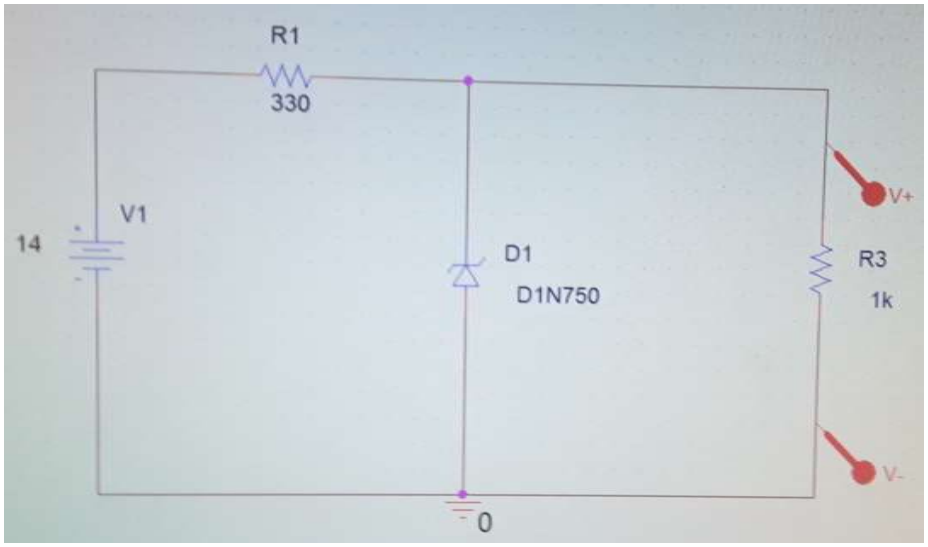


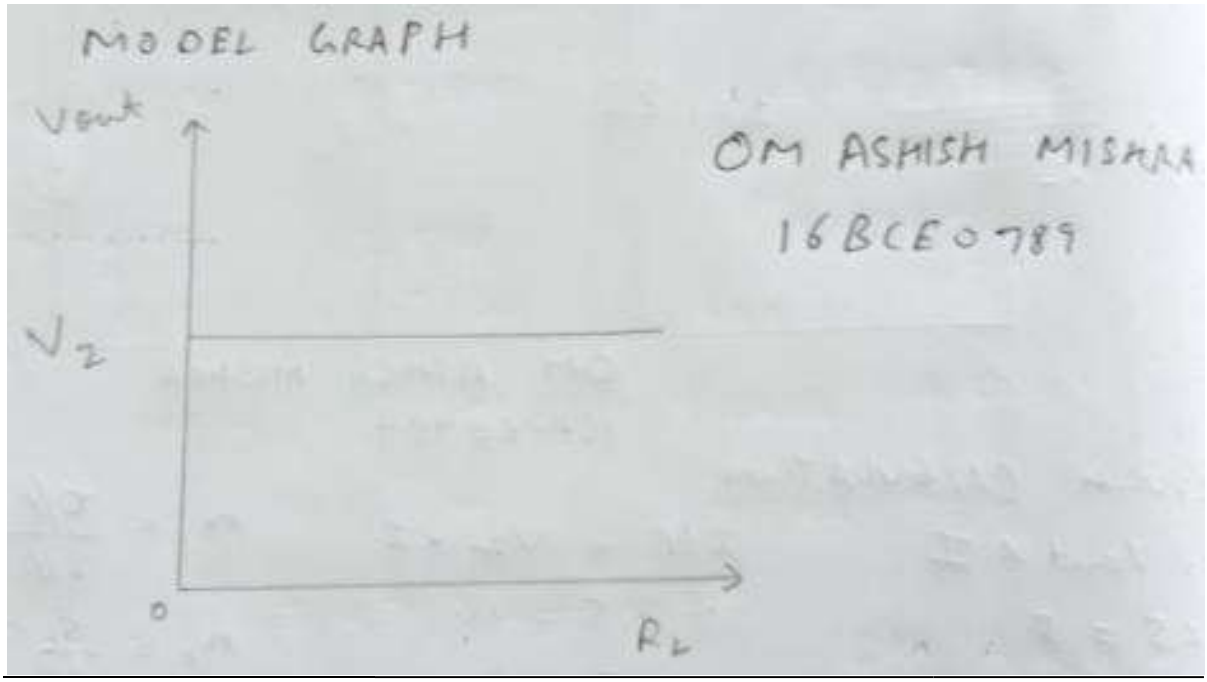
Fig: The Line Regulation circuits with different input voltages.

TABULATION:

V_{IN}(V)	V_{OUT}(V)
2	1.5
4	3.0
6	4.62
8	4.67
10	4.67
12	4.67
14	4.67

Load	Voltage
1kohm	4.6705V
2kohm	4.6802V
3kokm	4.6831V

MODEL GRAPH:



SIMULATION GRAPH:

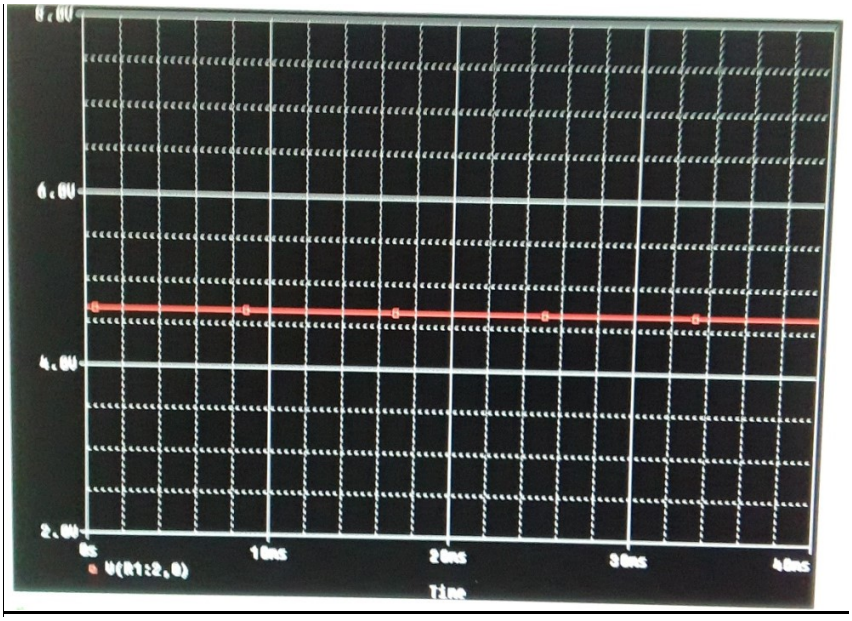


Fig: The graph shows that we get a constant output voltage of 4.67V.

RESULT:

The load regulation voltage is 4.67V and this is the constant voltage maintained by the Zener diode.

INFERENCE:

This experiment shows that with the help of a Zener diode we can get a circuit with constant voltage irrespective of the current flowing through the circuit.