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School of Electrical Engineering

Course Title: Introduction to Engineering

Course Code: BEEE101N

Design of 5V regulated DC Power Supply using Voltage Regulator IC (LM7805)

Learning objectives:

- Understand the operation of a voltage regulator circuit.
- Analyze the operation of rectifier circuit with capacitor filter connected to a voltage regulator IC.
- Determination of output voltages without and with the voltage regulator.
- Study the application of voltage regulators.

Components required for hardware setup:

Sl. No.	Item	Range	Quantity
1	Transformer	230/12 V	1
2	PN Junction Diode	1N4002 or IN4007	4
3	Capacitor (C_1)	10µF to 470µF (any value)	1
4	Capacitor (C_2 and C_3)	0.01µF	2
5	IC 7805		1
6	Resistive Load	≥1kΩ	1
7	Breadboard	-	1
8	Wires	-	As required
9	Oscilloscope with voltage probes	-	1

Circuit Diagram of 5V Regulated DC power supply using Full Wave Diode Bridge Rectifier and Regulator IC (LM7805)

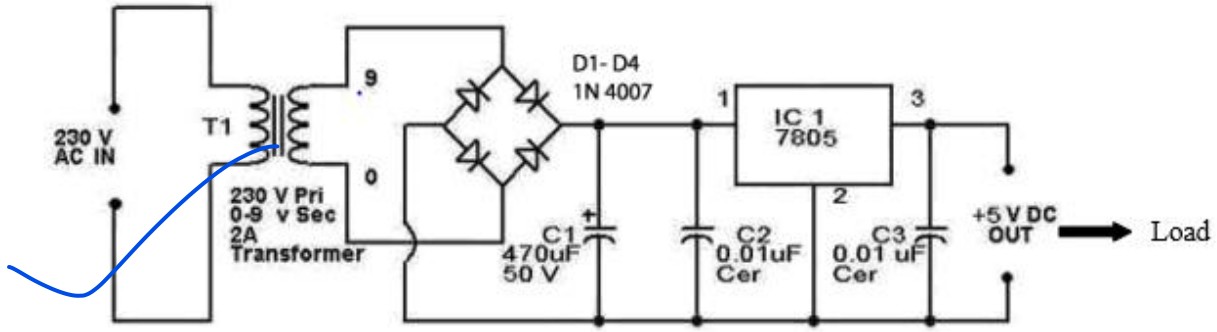

Figure 1. 5V Regulated DC power supply using LM7805

Theory:

A voltage regulator is an electronic circuit that provides a stable DC voltage independent of the load current, temperature and AC line voltage variations. Electronic voltage regulators are found in many power supply devices/adapters such as computer power supplies where they stabilize the DC voltages used by the processor and other elements. A voltage regulator IC maintains the output voltage at a constant value. 7805 Voltage Regulator, a member of the 78xx series of fixed linear voltage regulators used to maintain such fluctuations, is a popular voltage regulator integrated circuit (IC). The pin diagram of LM7805 is shown in Figure (2).

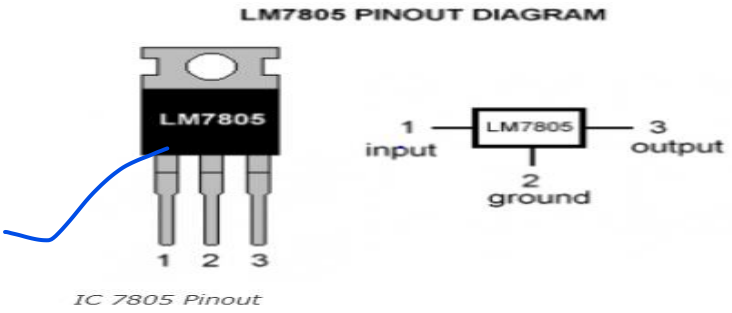

Figure 2. Pin Diagram of LM7805

Experimental Procedure:

1. Plug the transformer in to the AC power socket and measure the voltage at the secondary side of the transformer using oscilloscope.
2. Build the rectifier and regulator circuit using 4 diodes, required capacitors, voltage regulator IC and the transformer as shown in the circuit diagram.
3. Observe and measure the voltage across the rectifier (before IC) with the help of an oscilloscope. Record the resulting waveform.
4. Now, observe and measure the output voltage of regulator circuit. Record the resulting waveform.

Observations:

S.No	**Maximum value of transformer output voltage (V_m)**	**RMS value of unregulated voltage across C_1 or C_2 ($V_{rms} = V_m/\sqrt{2}$)**	**Average value of unregulated voltage across C_1 or C_2 ($V_{avg}=2V_m/\pi$)**	**Regulated Voltage across Load ($V_{regulated}$)**
1				