**LINEAR POWER SUPPLIES**

**Aim of the Experiment**

In this experiment, we provide linear DC power supplies for of generic electrical circuits from AC mains power and we investigate working mechanism of linear power supplies under some circumstances.

**Rectifying the Source**

In this part of experiment, we setup and investigate half-wave rectifier and full wave rectifier voltage and current values and graphics from voltmeter, ammeter and oscilloscope. We setup positive power supply and negative power supply circuits according to the experiment data sheet. In both half-wave and full wave circuits, we adjust rheostat for flow approximately 50mA current on it. We observe the voltage and current shapes of signals from oscilloscope. For observing current shape of signal, we connect second channel of oscilloscope’s probes to two terminals of 1Ω resistors.

Switch on the circuits is used for determining the second diode on the circuits so we can switch between half-wave and full-wave rectifying mode easily. If the switch is open, the circuit has only one diode so it woks as half-wave rectifier and if switch is closed, the circuit has two diodes so it works as full-wave rectifier.

We simply swap the diodes direction to change the positive voltage source to negative voltage source. If the diodes connect oppositely to the circuit, they pass reverse current about to first circuit so the negative voltage occurs.

Results of the first half of the experiments are shown below:

**Half-Wave Rectifier**

Measurement:

Ip = 140mA Vp = 22.5V

IDC = 51mA VDC = 7.9V

Calculation:

IDC = Ip / π IDC = 140mA / π = mA

VDC = Vp / π VDC = 22.5V / π =

**Full-Wave Rectifier**

Measurement:

Ip = 140mA Vp = 22.5V

IDC = 103mA VDC = 15.6V

Calculation:

IDC = 2Ip / π IDC = 2140mA / π = mA

VDC = 2Vp / π VDC = 222.5V / π =

As it can be seen from above, half-wave rectifier circuit’s DC current and DC voltage values are half of the Full-wave rectifier circuit’s.

**Filtering and Regulating the Source**

In this part of experiment, we improve the shape of the source by filtering it via capacitors and we fix the voltage to stable voltage value by regulating it.

Capacitor charges itself when the wave increasing and it discharge itself relatively slowly when the wave decreasing. In between two waves capacitor keeps some voltage on itself and feed the circuit. So output signal becomes less choppy. Although the capacitor, the output is still choppy, so a zener diode and a transistor pair are used for regulating the circuit so its voltage can keep stable. Zener voltage and transistors base-emitter voltage determine the fixed output voltage value.

**Without a capacity**

Measurement:

VP1 = 24V VP0 = 12V

VDC = 9V IDC = 100mA

**Without 470μF capacity**

Measurement:

VP1 = 24V VP0 = 12V ∆V = 1.5V

VDC = 11.7V IDC = 131.5mA

**Without 4700μF capacity**

Measurement:

VP1 = 24V VP0 = 12V ∆V = 0.5V

VDC = 11.7V IDC = 132mA

As it can be seen from above, larger capacitor provides us more well-formed or less choppy output voltage.