**Experiment No: 2**

Title: Battery level Indicator.

**Aim and Objective of the Experiment**:

● To understand voltage division concept, current division concept and principle of operation

of LED.

● To develop a micro project (Battery level indicator) based on the concepts learned in the

form of various task performed in the experiment.

**1)Mention some applications of battery level indicator.**

Ans.Battery level indicator will let you know the status of battery of a device just by glowing the

number of LED's. You can use this battery level indicator circuit with your inverter or with

your car battery; it will give you indication about your battery status. So before your battery

dies you can recharge it. Advantage of this circuit is it does not require power supply; it will

take power supply from the battery of the device itself.

.2)Explain practical usage of Voltage- division concept?

Ans.The voltage divider rule is used to solve circuits to simplify the solution. Applying this rule

can also solve simple circuits thoroughly The main concept of this voltage divider rule is “ The

voltage is divided between two resistors which are connected in series in direct proportion to

their resistance. The voltage divider involves two important parts they are the circuit and the

equation.

3)Explain working of Battery Level Indicator implemented in this experiment in your own words?

Ans. Battery level indicator is used for circuit to work . So we apply the power supply and adjusts RV1 so that led1 just starts glowing. When the input voltage in steps increases , we see led2 is glown . Similarly increase the voltage in steps so LED3 and LED 4 will glow

**Experiment No: 3**

Title: Thevenin’s Theorem & Norton’s Theorem.

Aim and Objective of the Experiment:

● To Verify for Thevenin’s Theorem for the circuit

● To Verify Norton Theorem for the Circuit.

**Thevenin’s Theorm**

Thevenin's Theorem states that “**Any linear circuit containing several voltages and resistances can be replaced by just one single voltage in series with a single resistance connected across the load**“.

**STEPS**

1. Connect the circuit as shown in the circuit diagram.2. Set V1, V2 and measure open circuit voltage VTh across load terminals A and B. 3. Replace all the voltage sources by Short circuit and measure the RTh across terminals A and B as per the circuit diagram shown in the figure. 4. Draw Thevenin’s equivalent circuit and determine the value of load current from it. 5. Verify the results theoretically.

**Norton’s Theorem**

Theorem states that **it is possible to simplify any linear circuit**, no matter how complex, to an equivalent circuit with just a single current source and parallel resistance connected to a load.

**STEPS**

1. Connect the circuit as shown in the circuit diagram. 2. Set the voltages V1, V2 3. Remove the load resistance and measure the short circuit current ISC through A and B terminals. 4. Replace all the voltage sources by Short circuit and measure RTh across terminals A and B as per the circuit diagram shown in the figure. 5. Draw Norton’s equivalent circuit and determine the value of load current. 6. Verify the results theoretically

**Experiment No: 4**

Title: Maximum Power Transfer Theorem

**Aim and Objective of the Experiment:**

● To observe maximum power transfer in D.C. circuit.

**Maximum Power Transfer Theorem**

maximum power transfer theorem states that, to **obtain maximum external power from a source with a finite internal resistance**, the resistance of the load must equal the resistance of the source as viewed from its output terminals.

**Experiment No: 5**

Title: Mobile Battery Charger

**Aim and Objective of the Experiment:**

· To understand the working of Mobile Battery Charging Circuit

· To implement the circuit of Mobile Battery charger on Breadboard and observe the waveforms

at various points (Input and output Waveforms for Bridge Rectifier) and measure the output

voltage

**1. Explain working of Mobile Battery charger circuit**

ANS :- There are three fundamental parameters that need to be considered while charging the

battery safely:

Constant Current (CC)

Constant Voltage (CV) and

Auto Cut-off

First you must connect all the required parts in the circuit and then run it . here the 12v DC

charging voltage is provided by the regulator and when the switch S1 is pressed, the charger

starts working and the power-on LED glows to indicate the charger is ‘on’.

**2. Explain the working principle of Turbo- charger for mobile phones .**

ANS :-The charging process can be divided into three parts.

1 – Constant Current: Voltage increases towards its peak, while current stays constant at a

high level. This is the phase where a lot of power is quickly delivered to the device.

2 – Saturation: This is the phase where the voltage has reached its peak and current drops

down.

3 – Trickle/Topping: The battery is fully charged. In this phase, the power will either slowly

trickle in, or will periodically charge a low “topping” amount as the phone consumes battery.

The amount of power and length of each process depends on the fast-charging standard. A

standard is an established charging process that corresponds to a particular device, charger, and

power output.

**3. State commonly used types of mobile phone batteries.**

ANS:- Mobile phones run on a variety of different batteries depending on the phones

maker, its size, shape, and features. Essentially, there are 4 different types of battery

available for mobile phones, each of which which will be employed in different types of

phone.

The 4 types of battery technology are as follows: 1. Lithium Ion The technology employed in lithium ion batteries is advanced, and this allows for an incredibly high charge capacity relative to the size and weight of the battery. 2. Lithium Polymer Lithium polymer batteries are the most advanced batteries available on the market. The battery is cased in plastic, rather than metal, making it sleeker, lighter, smaller, and safer than other types of battery. 3. Nickel Cadmium 4. Nickel Metal Hydride Nickel metal hydride batteries are the same size and shape as nickel cadmium batteries, but can contain twice as much energy, and can run for between 30 and 40 per cent longer.

**4.Explain how to maximize Battery Performance/ Battery life of your mobile phone?**

ANS :- There are several ways to maximize battery life aand performance. 1. SWITCH ON BATTERY SAVER MODE. 2. CHARGE SMART. 3. TURN OFF BLUETOOTH AND WI-FI WHEN NOT IN USE 4. LOWER THE SCREEN BRIGHTNESS. 5. TURN OFF LOCATION TRACKING FOR APPS THAT DON’T NEED IT 6. TURN OFF VISUAL EFFECTS, LIVE WIDGETS, AND LIVE WALLPAPER.

**5. Write important specifications of Voltage regulator IC 7805**

ANS :- 5V Positive Voltage Regulator Minimum Input Voltage is 7V Maximum Input Voltage is 25V Operating current(IQ) is 5mA Internal Thermal Overload and Short circuit current limiting protection is available. Junction Temperature maximum 125 degree Celsius

**Experiment No: 6**

**Title: Zener diode voltage regulator**

**Aim and Objective of the Experiment:**

· To understand the working of Zener diode as voltage regulator

· To calculate line and load regulation of Zener diode based shunt regulator

THEORY

A zener diode functions as an ordinary diode when it is forward biased. It is a specially designed device to operate in the reverse bias. When it is in the reverse breakdown region, the voltage (Vz) across Zener diode remains almost constant irrespective of the current (Iz) flowing through it. A series resistor A series resistor Rs is used to limit the zener current below its maximum current rating. The current through Rs is given by the expression is IS=IZ+IL , where IL is the current through the load resistor . The value of Rs must be properly selected to ensure break down of the Zener diode and also to keep Iz in limited in specified current limit.

Rsmin= (Vin-Vz)/Izmax (1)

Rsmax= (Vin-Vz)/(Izmin + IL)

**Experiment No: 7**

Title: Power factor improvement (series Capacitor)

**Aim and Objective of the Experiment:**

· To improve power factor of a single phase inductive AC circuit using capacitor in series with it.

Theory:

When we need to convert electrical energy to mechanical energy, electric motors are used for it.These AC motors converts electric energy in two forms namely mechanical energy in the form of rotary motion and other is magnetic field. Magnetizing currents are lagging to the supply voltage.This magnetic energy is not a mechanical energy so it is kind of wastage, but without which motor will not run and convert electric energy into mechanical energy. Such form of energy is called as reactive power. Reactive power must be as less as possible so that the load will utilize maximum power and current requirement will be less for the same amount power. As the current requirement is less, so wire thickness will be small in diameter. Installation cost and energy cost will be also reduced. To reduce reactive power of the circuit, different power factor improvement methods are used. One of the most familiar method is the use of capacitor bank. We can use capacitor in series with the load or across the load. Following diagrams are illustrating effect of PF on active power.

1. What are benefits of connecting capacitor across the load to improve circuit PF?

Answer: Capacitors provide a voltage boost, which cancels part of the drop caused by system loads.Switched capacitors can regulate voltage on a circuit.

Capacitors work their magic by storing energy. Capacitors are simple devices: two metal plates sandwiched around an insulating dielectric. When charged to a given voltage, opposing charges fill the plates on either side of the dielectric. The strong attraction of the charges across the very short distance

separating them makes a tank of energy. Capacitors provide power just when reactive loads need it. Just when a motor with low power factor

needs power from the system, the capacitor is there to provide it. Then in the next half cycle, the motor releases its excess energy, and the capacitor is there to absorb it. This benefits the system because that reactive power (and extra current) does not have to be transmitted from the generators all the way through many transformers and many miles of lines; the capacitors can provide the reactive power locally. This frees up the lines to carry real power, power that actually does work.

· Reactive component of network and the total current at the end tip system is reduced as well as the

power loss, I square R in the system is reduced because the current decreases. The capacity of the

electricity distribution network also increases, reduced the need to install additional capacity.

· Low Voltage Drop

· Saving in the power bill

· Better usage of power system, lines and generators etc.

Saving in energy as well as rating and the cost of the electrical devices and equipment is reduced.

Experiment No: 8

Title: Power factor improvement (parallel)

Aim and Objective of the Experiment:

· To improve power factor of a single-phase inductive AC circuit using capacitor across the load.

Post Lab Subjective / Objective type Questions:

1. What are benefits of connecting capacitor across the load to improve circuit PF?

Answer: Capacitors provide a voltage boost, which cancels part of the drop caused by system loads. Switched capacitors can regulate voltage on a circuit. Capacitors work their magic by storing energy. Capacitors are simple devices: two metal plates sandwiched around an insulating dielectric. When charged to a given voltage, opposing charges fill the plates on either side of the dielectric. The strong attraction of the charges across the very short distance separating them makes a tank of energy. Capacitors provide power just when reactive loads need it. Just when a motor with low power factor needs power from the system, the capacitor is there to provide it. Then in the next half cycle, the motor releases its excess energy, and the capacitor is there to absorb it. This benefits the system because that reactive power (and extra current) does not have to be transmitted from the generators all the way through many transformers and many miles of lines; the capacitors can provide the reactive power locally. This frees up the lines to carry real power, power that actually does work.

· Reactive component of network and the total current at the end tip system is reduced as well as the power loss, I square R in the system is reduced because the current decreases. The capacity of the electricity distribution network also increases, reduced the need to install additional capacity.

· Low Voltage Drop

· Saving in the power bill

· Better usage of power system, lines and generators etc. · Saving in energy as well as rating and the cost of the electrical devices and equipment is reduced.

Conclusion:

Power factor of a single-phase inductive AC circuit using capacitor across the load is successfully

improved.

Experiment No: 9

Title: Measurement of Power using Two Wattmeter Method

**Aim and Objective of the Experiment:**

● To measure the power of three phase power using Two Wattmeter Method

Conclusion:

We used two wattmeters to successfully determine the power of a three phase system

**Experiment No: 10**

Title: Inverting and Non-inverting amplifier using OPAMP

Aim and Objective of the Experiment:

● To understand the open loop configuration of OPAMP

● To understand the concept of negative feedback and closed loop configuration of OPAMP.

● To understand inverting and Non-inverting amplifier of OPAMP

● To find gain of inverting and non-inverting amplifiers

1. List the characteristics of an Ideal operational amplifier.

Ans- 1. Infinite input impedance

2. Zero output impedance

3. Zero common-mode gain, or, infinite common-mode rejection

4. Infinite open-loop gain A

5. Infinite bandwidth

1. List the important parameters of the IC 741 operational amplifier.

Ans- Important Parameters are1. Open Loop Gain-105to 108 2. Input Resistance- 105 to 1013 3. Output Resistance- 10 to 100