**Fundamental of Electro System**

**Chapter 1**

**Question Answer ( 1 marks each).**

1. Define Electric Charge.

- The electric Charge is the electric property of electron and proton present in an atom.

1. Define Static Electricity.

- The electricity produced due to the change in the number of electrons in a non-conducting body or by rubbing is called Static Electricity.

1. Define Current Electricity (Dynamic Electricity).

-The Form of energy produced due to the continuous flow of electrons through a conductor is called current.

1. Define Hydroelectricity.

-Those source of electricity which is produced from water by converting the kinetic energy of water into electrical energy is called Hydroelectricity.

1. Define Solar Electricity.

-Those Form of electricity which is produced from the sunlight is called solar electricity.

1. List application (uses) of electricity.

-The application of electricity are given below :

i) Entertainment

ii) Health Care

iii) Engineering

iv) Office.

1. How can you use electricity for entertainment.

-Electricity is used to run different electrical devices such as Joystick, computer's mobile phones, etc. These devices is used for entertainment purpose. Without electricity these devices cannot work properly.

1. Define atom.

-An atom is the smallest particles of elements which is indivisible and takes part in chemical reaction as a whole or without division.

1. List components of atom.

- The components of atom are given below:

i) Electron

ii) Proton

iii) Neutron

iv) Isotopes

1. Define (Components of Atom).

- Electrons are the negatively charged sub-atomic particle which are revolving around the nucleus of an atom.

- Protons are the positively charged sub-atomic particles which are present inside the nucleus with neutron.

- Neutron's are the chargeless sub-atomic particles of an atom which is present inside the nucleus of an atom.

-Isotopes are those form of atom which have same number of proton but different number of neutrons.

1. Define atomic nucleus.

- The atomic nucleus is the small, dense region consisting of protons and neutrons of the center of an atom.

1. Define atomic Mass.

- Atomic mass is the sum of protons and neutrons that are present in the nucleus of an atom.

1. Define atomic Weight.

- Atomic weight is the average mass of atoms of an element, calculated using the relative abundance of isotopes in naturally occurring element.

1. Define Free electrons.

- Free electrons are those electrons which is not attached to the nucleus of a atom and are free to move when external energy is applied are called free electrons.

1. Define electric field.

- Electric field is a region around a charge particle or object within a force would be exerted on other charged particles or object.

1. Define electric potential.

- Electric potential is the difference in potential energy per unit charge between two location in the electric field.

1. Define potential difference

- Potential difference between any two points in an electric circuit is defined as the amount of work done in moving unit charge from one point to the other point.

1. Define electrical energy.

- Electrical energy is the form of kinetic energy which is produced by the movement of the electrical charges.

1. State Colomb's law.

- Colomb's law state that the electrical force between two charged objects is directly proportional to the product of quantity of charge on the objects and Inversely propotional to the square of the separation distance between two objects.

1. List limitation of colombs law.

- The limitation of colomb's law are given below:

i) The law is applicable only for the point charges at rest.

ii) Colomb's law can be only applied in those cases where the inverse square law is obeyed.

iii) It is difficult to implement Colomb's law where charges are in orbitary shape because in such cases we cannot determine the distance between the charges.

iv) The law can't be used directly to calculate the charge on the big planets.

**Question Answer ( 2 marks each).**

1. What do you mean by electro statics. Explain.

- Electrostatics is the branch of electro magnetism, which deals with the interaction of electric charges when all the charges are stationary, is called as electrostatics.

1. List types of electricity and explain any one.

- The types of electricity are given below :

i) Static Electricity.

ii) Current Electricity( Dynamic Electricity).

Current is the rate of flow of electrons. It is produced by moving electrons and it is measured in amperes. Unlike static electricity, current electricity must flow through a conductor, usually copper wire. Current with electricity is just like current when you think of a river.

1. List uses of electricity and explain any two.

- The uses of electricity are given below :

i) Entertainment ii) Health Care iii) Engineering

iv) Transport and communication v) Outdoors

vi) Household vii) Commercial viii) Office

ix) Fuel x) Space.

Uses of electricity in commercial places.

For the production of various materials the factory uses heavy machinery which always runs on electricity. Even the magnets which are of a gaint like structures require electricity to keep it charged for lifting heavy metals.

1. Define atom and list its components.

- Atom is the smallest particle of an atom which is indivisible and takes part in chemical reaction as a whole or without division is called its atom. The components of atom are listed below :

i) The Nucleus ii) The Protons iii) The Neutrons

iv) The Electrons v) The Isotopes

1. Define Isotopes and give any one example.

- Isotopes are those form of atoms which have same number of proton but different number of neutrons. For example , Normal hydrogen has 1 proton and 0 neutron: The isotopes of hydrogen are :

i) Protium = 1proton, 1 neutron

ii) Deuterium = 1 proton, 2 neutron

iii) Tritium = 1 proton, 3 neutron.

1. State and explain colomb's law in detail.

**Question Answer ( 4 marks each).**

1. Explain types of electricity in details.

- The types of electricity are given below :

i) Static Electricity

Static electricity is when electrical charges build up on the surface of a material. It is usually caused by rubbing materials together. The result of a build-up of static electricity is that objects may be attracted to each other or may even cause a spark to jump from one to the other. For Example. Rub a baloon on a wool and hold it up to the wall.

ii)Current Electricity

Current is the rate of flow of electrons. It is produced by moving electrons and it is measured in amperes. Unlike static electricity current electricity must flow through a conductor, usually copper wire. Current with electricity is just like current when you think of a river.

1. List uses of electricity and explain any four. Define atom and explain its various components.

- The uses of electricity are given below

i) Entertainment ii) Health Care iii) Engineering

iv) Transport and communication v) Outdoors

vi) Household vii) Commercial viii) Office

ix) Fuel x) Space

Uses of electricity in entertainment.

Today, the modern sources of entertainment starting from listening to music from mp3 players, watching Television, playing movies in DVDs or VCDs or VCRs runs on electricity.

Uses of electricity in Engineering.

Constructions of buildings and structures for the convenience of people require electricity in every step. Building houses, installing gates and windows, welding of materials require current electricity to operate the machines.

Uses of electricity in outdoors.

The street light on the road uses electricity to function, even the pool requires electricity to heat the water in colder regions. The lawn mover, which is used to cut grass uses electricity to operate. The water sprinkler for the grass on the lawn uses electricity as well.

Uses of electricity in household.

Starting from toaster to refrigerator, microwave, washing machine, dishwasher, electrical chimney and many more appliances which are simple to use and made for the convenience of day to day activities use electricity to function.

**Chapter 2**

**Very Short Answer Question. ( 1 marks each).**

1. Define potential difference.

- Potential difference is the difference in the amount of energy that charge carries (electrons) have between two points in a circuit. Which is measure in volts.

1. Define electric current.

- Electric current is rate of flow of electrons through a conductor.

1. Define electrical resistance.

- The electrical resistance of an object is measure of its opposition to the flow of electric current.

1. Write the formula to calculate resistivity and conductivity. From given V and I

- The formula to calculate resistivity is R = V / I.

- The formula to calculate conductivity is G = I / V.

1. Define capacitors.

- Capacitors is the basic electric components which have ability to store electrical energy in it. It is measured in farad (F).

1. List standards units of capacitance.

- The standard units of capacitance are listed below :

i) Pico Farad (pF) ii) Nano Farad (nF)

iii) Micro Farad (uF) iv) Milli Farad (mF)

v) Kilo Farad (kF)

1. Define inductor.

- An inductor is the basic electric component consisting of a coil o wire which is designed to take the advantage of relationship between magnetism and electricity as a result of electric current passing through it.

1. Define Conductor.

- A conductor is a substance or materials which can pass electricity through them.

1. Define Insulator.

- Insulators are the substance which cannot pass electricity through them.

1. Define Semi Conductor.

- Those substance which allow partially flow of electricity through them are called semi-conductor.

1. List any five example of conductors.

- Any five examples of conductors are :- Gold, Silver , Iron , copper, zinc.

1. List any five example of insulators.

- Any five examples of insulators are :- Glass, Plastic, Rubber, Porcelin, Wood.

1. List sources of electricity.

- The sources of electricity are listed below :

i) Nuclear Power Plant. Ii) HydroElectricity.

iii) Wind Energy . iv) Thermal Power Project.

1. Define sources of electricity.

- The substance or materials which continuously generates electricity is called sources of electricity.

1. Define nuclear fission and fusion.

- Nuclear fission is the splitting of a heavy nucleus into lighter nuclei.

- Nuclear fusion is the combining of nuclei to form a bigger and heavier nucleus.

1. List uses of resistors.

- The uses of resistors are listed below :

i) Circuit functions

ii) Heating

iii) Frequency and Timming

iv) LEDs and transistors.

1. List factors that affect the resistance of conductor.

- The factors that affect the resistance of conductor are given below :

i) Lengh of materials.

ii) Cross Sectional area of materials.

iii) Nature of materials.

iv) Temperature of materials.

**Short Question Answer**

1. Define capacitors and list SI unit of capacitance.

- Capacitors is the basic electric component which have ability to store electrical energy in it. Its SI unit is farad.

1. List any five examples of conductors and insulators each.

- Any five examples of conductors are given below :

i) Gold ii) Silver iii) Aluminium iv) Copper v) Zinc

- Any five examples of insulators are given below :

i) Plastic ii) Rubber iii) Glass iv) Porcelian v) Woods.

1. List sources of electricity and explain any three.

- The sources of electricity are listed below:

i) Hydro Electrical Energy.

ii) Nuclear Fission and Fusion.

iii) Wind or Electrical Energy.

iv) Thermal Power.

v) Solar Energy.

i) Hydro Electrical Energy

Hydroelectric Energy also called Hydroelectric power or hydroelectricity, is a form of energy that harness the power of water in motion- such as water flowing over a waterfall- to generate electricity. People have used this force for Over two thousand years ago, people in Greece used flowing water to turn the wheel of their mill to ground wheat into flour.

ii) Nuclear fission and fusion.

Fission occurs when a neutron slams into a larger atom, forcing it to excite and split into two smaller atoms - also known as fission products. Fusion occurs when two atoms slam together to form a heavier atom, like when two hydrogen atoms fuse to form on helium atom.

iii) Wind as electrical Energy.

Wind is used to produce electricity using the kinetic energy created by air in motion. This is transformed into electrical energy using wind turbines or wind energy conversion systems.

1. List uses of resistor and explain any three.

- The uses of resistor are given below :

i) Circuit functions

ii) Heating

iii) Dividing Voltage.

iv) LEDs and transistors.

v) Frequency And Timming

i) Resistor usage in circuit functions.

There are various types of resistors that work according to the usage range. In that, we can set the resistance by using a knob kind of features.

ii) Resistor usage in heating purpose.

Because of the nature of generating heat when conducting current, resistors are used in a heater, toaster, microwave, electric stove and many stove heating appliances.

iii) Resistor usage for dividing voltage.

Dividing the voltage works some components need to work in a much lesser voltage than the supplied input voltage.

1. List important properties of insulators.

- The important properties of insulators are given below :

i) They have high resistivity.

ii) They have high DI Eelectric Strength.

iii) They have high relative permittivity.

iv) They have high electrical dissipation.

1. List factor affecting the resistance of conductor and explain any two.

- The factor affecting the resistance of conductors are listed below :

i) Cross-Sectional area of wire.

ii) Length of wire.

iii) Temperature

iv) Nature of materials.

**Long Question Answer**

1. Explain factors affecting the resistance of conductor.

- The resistance of a conductor depends upon Temperature, Nature of materials, cross-sectional area of wire and length of wire. The resistance of a conductor is high in more length of wire but it has low resistance when the length of wire is decreases. Similarly, The resistance of wire is decreases. Similarly, The resistance of a conductor is increased when the temperature is increased. Some materials have different resistance some materials have different resistance such as copper have low resistance than aluminium.

1. Classified the objects on the basis of resistance or conductance.

- The classification of the objects on the basis of resistance or conductance are given below :

i) Conductor

Those substance or materials which allow electrons to flow through them are called conductor.

ii) Insulators

Those substances or materials which do not allow electrons to flow through them are called Insulators.

iii) Semi-Conductors

Those substance or materials which allow partially flow of electrons is called semi-conductors.

1. Explain uses of resistor.

- Resistor is used in different electric devices such as torch light, charger, heater, radios, etc. Because of the nature of generating heat when conducting current, it is used in different electric heater. Resistors is also used to identify the level of battery. It also works as a voltage divider.

1. Define resistor. Mention its unit and explain uses of resistor.

- Resistor is an electric components which oppose the flow of electrons. It is represented by R and it is measured in ohm. The resistance R of an object is defined as the ration of voltage V across it to current I through it.

**Chapter 3**

**Short Question Answer**

1. Define Electric Circuit.

- Electric circuit is a path through which electric current flows which can also be a closed path and open path.

1. List different types of Electric Circuit.

- The different types of electric circuit are listed below :

i) Series Circuit ii) Parallel Circuit

iii) Series-Parallel Circuit iv) Star- Delta Circuit

v) Resistive Circuit vi) Inductive circuit

vii) Capacitive circuit viii) Resistive, inductive

ix) Active circuit x) Passive circuit

xi) Open Circuit xii) Short Circuit

xiii) Closed Circuit.

1. Define Series Circuit.

- Those types of circuit which have only one path for the flow of electrons is called series circuit.

1. Define Parallel Circuit.

- These types of circuit which have two or more conducting path for the flow of electrons is called parallel circuit.

1. Define Open Circuit.

- Those type of circuit in which there is no return channel for current to flow is called open circuit.

1. Define Short Circuit.

- These types of circuit which has a return channel for current to flow in it and voltage tends to infinity, current tends to zero is called short circuit.

1. Define Closed Circuit.

- Closed circuit is the term used when a load in a circuit functions on it own.

1. Define Domestic Electric Circuit.

- Those type of circuit which is used in our homes to run different electrical devices is called domestic electric circuit.

1. List the different types of wires in domestic circuit.

- The different types of wires in domestic circuit are :-

i) Earth Wire ii) Live Wire iii) Neutral Wire

1. Write some precaution that should follow while using electric circuit.

- Some precaution that should follow while using electric circuit are listed below :-

i) Always use good quality wires which have proper insulation and thickness.

ii) The connections of the wires should be tight and completely insulated.

iii) We should always switch off the main supply before starting any repair work of the electric circuit.

iv) We should not touch bare electric wires with wet hands.

1. State Ohms law.

- Ohm's law states that " When the physical conditions and temperature remain constant voltage across a conductor is directly proportional to the current flowing through it.

1. List the limitation of ohm's law.

- The limitation of ohm's law are listed below :-

i) Ohm's law is not applicable for unilateral electrical elements like diodes and transistors as they allow the current to flow through in one direction only.

ii) Ohm's law is only applicable in metallic conductors. So it won't work in the case of non-metallic conductors.

iii) If I is the current for a certain V, then reversing the direction of V keeping it's magnitude fixed, does not produce a current of same magnitudes as in the opposite direction.

1. List the application of Ohm's law in Daily Life.

- The application of ohm's law are listed below :-

i) In electric fuses.

ii) To know power consumption.

iii) To control the speed of the fans in our houses.

iv) For deciding the size of resistors.

1. State and explain Kirchhoff's Current Law.

- Kirchhof's current law states that for a parallel path the total current entering a circuits junction is exactly equal to the total current leaving the same junction.

This idea by kirchhoff's is commonly known as the conservation of charge as the current is conserved around the junction with no loss of current.

Here in this simple junction example the current It leaving the junction is the algebraic sum of the two currents I1 and i2 entering the same junction that is It = I1 + I2.

1. State and explain Kirchhoff's Voltage law.

- Kirchhoff's voltage law states that the algebraic sum of all the potential differences around the lop must be equal to zero, Note that the term " Algebric sum" means to take into account the polarities and signs of the sources and voltage drops around the loop.

This idea by kirchhof's is commonly known as the conservation of energy, as moving around a closed loop, or circuit, you will end up back to where you started in the circuit and therefore back to the same initial potential with no loss of voltage drops around the loop must be equal to any voltage sources met along the way.

**Chapter 4**

**Very short question answer ( 1 marks each)**

1. Define electrical power.

- Electrical power is the rate per unit time, at which electrical energy is transferred by an electric circuit.

1. List types of component in electric circuit.

- The types of component in electric circuit are listed below : -

i) Active Components.

ii) Passive Components.

1. Define Watt.

- One watt is the rate at which work is done when a current of one ampere, I of current flows through a network which has an electrical potential difference of one Volt.

1. List multiples and submultiples of watt.

- The multiples of watt are listed below :

i) kilo Watts (kw)

ii) Mega Watts ( mw)

- The submultiple of watt are listed below

i) Femto watts (fw)

ii) Pico watts (pw)

iii) nano watts(nw)

iv) micro watts ( mw)

v Milli watts (mw)

1. Write the formulas used for calculating electric power.

- The formulas used for calculating electrical power are listed below :

i) W = VI

ii) W = I2R

iii) W = V2/R

1. Define electrical energy.

- Electrical energy is the energy derived from electrical potential energy or kinetic energy of the charged particles.

1. List uses of electrical energy.

- The uses of electrical energy are listed below :

i) Electric motors, movers, generators and storage batteries etc.

ii) Transportation, Vehicles, Electric Transaction, plane and communication.

iii) Escalators, elevators and electronic ladders.

iv) Lightining, heating and cooling i.e. air conditioning, welding and molding, etc.

v) Construction, manufacturing, healthcare, engineering, entertainment, electronics appliances, computers, machinery and much more

1. List sources of electrical energy.

- The sources of electrical energy are listed below :

i) Hydroelectricity.

ii) Sun heat and light energy.

iii) Wind Power and energy.

iv) Nuclear energy.

vi) Lightining as transient energy.

**Long question and answer ( 4 marks each)**

1. Write sources and application of electrical energy in details.

- The sources of electrical energy are given below :

i) Hydroelectric and Water heat energy.

ii) Sun heat and light energy

iii) Wind power and energy.

iv) Nuclear energy

v) Fossil fuels, biofuel, biomass, etc.

vi) Lightining as Transient energy.

- The application of electrical energy are listed below :

i) Electric motor, movers, generators, and storage batteries, etc.

ii) Transportation, vehicles, electric transaction, plans and communication.

iii) Escalators, elevators and electronic ladder.

iv) lightining, heating and cooling i.e air conditioning, welding and molding, etc.

1. Explain different components of electric circuit with example.

- The components in an electric circuit can be divided into two categories.

i) Active devices ( power sources)

if the charges are moved by and exterior force through the device in the direction from the lower electric potential to the higher, so positive charge moves from the negative to the positive terminals.

ii) Passive Devices.

When electric charges move through a potential difference from a higher to a lower voltage, that is when conventional current moves from the positive terminal to the negative terminal, work is done by the charges on the device. The potential energy of the charges due to the voltage between the terminals is converted to the kinetic energy in the devices.

**Chapter 5**

1. Define cell.

- An electrical cell is an electrical power supply which converts the stored chemical energy into electrical potential energy, allowing positive charge to flow from positive terminal to the negative one through an external circuit.

1. Define battery. List types of battery.

- A battery is an electro chemical device that can store energy in the form of chemical energy. The types of battery are listed below :

i) Primary batteries.

ii) Secondary batteries.

1. List types of primary and secondary battery.

- The types of primary batteries are listed below :

i) Alkaline battery.

ii) Button Cell Battery.

- The type of secondary batteries are listed below :

i) Lead-acid batteries.

ii) Nickel-cadmium batteries

iii) Nickel-Metal hydride batteries.

iv) Lithium-ion batteries.

1. Define electric cell.

- An electric cell is an electric power supply which converts the store chemical energy into electrical energy.

1. Define Galvanic cell.

- An electromechanical cell that converts the chemical energy of spontaneous redox reactions into electrical energy is known as galvanic cell or a voltaic cell.

1. List application of primary and secondary cell.

- The application of primary cell are listed below :

i) They can be used in clock and toys.

ii) It can be used in small household devices.

iii) It can be used in personal computers.

1. List application of reserve cell, fuel cell.

- The application of reserve cell or battery are listed below :

i) It is used in devices for sensing time and pressure.

ii) They are largely used in weapons systems.

iii) They are also used in our car batteries and other vehicles.

1. List advantages of battery over other power sources.

- The advantage of battery over other power sources are listed below:

i) Specific Energy Capacity

ii) Power bandwidth

iii) Responsiveness

iv) Environment

v) Installation.

1. List drawbacks of battery.

- The drawbacks of battery are listed below :

i) Charge Time.

ii) Operation Cost.

iii) Energy Storage Capacity.

1. List the factors for choosing right battery according to your application.

- The factors for choosing right battery according to my application are listed below :-

i) Primary or secondary battery.

ii) Temperature range.

iii) Durability.

iv) Energy Density.

v) Safety.

1. Define Capacitor.

- Capacitor is an electrical component with a two-terminal that may store energy in the form of an electric charge.

1. List standard unit of capacitor.

- The standard unit of capacitor are listed below :

1uF = 10-6F,

1nF = 10-9F,

1pF = 10-12F, and so on.

1. List Characteristics of capacitor.

- The characteristics of capacitor are listed below :

i) Nomial Capacitance (c)

ii) Working Voltage (WV).

iii) Tolerance

iv) Leakage current.

V) Working Temperature.

vi) Temperature Coefficient (TC)

vii) Polarization.

viii) Equivalent Series Resistance (ESR).

1. List the factor affecting capacitance of capacitor.

- The factor affecting the capacitance of capacitor are listed below :

i) Plate Area

ii) Plate Spacing

iii) Dielectric Materials.

1. Explain primary battery and secondary battery in details.

- There are mainly two types of battery they are:

i) Primary Batteries.

The batteries made for one time use only and unable to recharge are called primary batteries. This type of battery is thrown away after use. It is also known as non-rechargeable batteries. It's a very simple and convenient source of power for portable devices like a watch, camera, torch, etc.

ii) Secondary batteries.

The battery which is made for reusable purpose by recharging are called secondary batteries. They are also called rechargeable batteries. They have the same electrochemical reaction as alkaline batteries but the electrochemical reaction can be reversed. This type of battery is used for portable devices like mobile phones, laptops, electric vehicles, etc. Also, a rechargeable battery is used with an inverter which stores power to supply our household devices.

1. Differentiate between cell and battery.

-The differentiate between cell and battery are listed below:

|  |  |  |  |
| --- | --- | --- | --- |
| S.N | Cell | S.N | Battery |
| 1 | A cell is the single unit device which converts chemical energy into electric energy. | 1. | A battery usually consists of group of cells. |
| 2 | Depending upon the types of electrolyte used a cell is either reserve, wet or dry types. | 2 | A battery is either primary battery or secondary battery meaning it is rechargeable or non-rechargeable |
| 3 | A cell is usually light and compact as it has a single unit. | 3 | Battery normally consists of several cells thus giving it a bigger size and is bulky. |
| 4 | A cell supplies power for a shorter period of time. | 4 | A battery can supply power for long durations. |
| 5 | A cell is mostly for lighter tasks which requires less energy. | 5 | A battery is mostly used for heavy duty tasks. |

1. Explain types of cells in details.

- There are mainly two types of cell they are primary and secondary cell. Non-rechargeable batteries also known as primary batteries or primary cell. Primary batteries are those which cannot be used again once their stored energy is being used fully. There batteries cannot restore energy by any external sources.

Rechargeable batteries are also known as secondary cell. It can be use again and again by plugging them into charge and get multiple uses before the battery needs to be replaced. The initial cost of rechargeable batteries is commonly more than disposable batteries but the total cost of ownership and environmental impact of these batteries are lower because they can be recharged inexpensively many times before they need to replace it.

1. Explain primary cell in details.

- None rechargeable batteries also known as primary batteries or primary cell. Primary batteries are those which cannot be used again once their stored energy is being used fully. These batteries cannot restore energy by any external source. This is the reason primary cells are also called disposable batteries. There are different types of primary cells they are:-

i) Zinc Carbon Battery

ii) Alkaline Battery

iii) Lithium cells

iv) Silver Oxide Cells

v) Zinc Air cells.

1. Differentiate between primary cell and secondary cell.

- The differentiate between primary cell and secondary cell are listed below :

|  |  |  |  |
| --- | --- | --- | --- |
| S.N | Primary Cell | S.N | Secondary Cell |
| 1 | Suitable for portable application due to light weight and smaller design. | 1 | Not suitable for portable devices. |
| 2 | Good Charge retention. | 2 | Inferior charge retention. |
| 3 | Not suitable for high cost application. | 3 | Highly recommended for backup and high cost applications. |
| 4 | Limited to specific applications. | 4 | Highly versatile and therefore has large spectrum of application. |
| 5 | Low initial cost. | 5 | Higher initial cost. |

1. Explain reserved cell and fuel cell in detail.

- The reserved batteries or cell are also known as stand-by battery. The electrolyte remains inactive in solid until the melting point is reached. As soon as the melting point is reached, ionic conduction begins and battery is activated.

There are four categories of reserve cell they are water activated batteries, heat activated batteries, electrolyte activated battery and gas activated batteries.

Fuel cell is a type of cell in which active materials are fed from outside source fuel cells are capable of producing electrical energy as long as active proton exchange membranges uses hydrogen and oxygen gas as fuel.

1. Explain advantage and drawbacks of battery.

- The energy storage capacity of battery is very less as compared to fossil fuel. It is capable of handling small and large loads more effectively due to high power bandwidth. It is able to deliver power over short notice. This means that warm up is required as in case of combustion engines. The batteries are easy to use.

But it has some disadvantages also, it takes hours to get recharged again for use. Price and weight of large batteries make it impractical for the reliable usage and large vehicles. The energy storage capacity of batteries is low.

1. Explain the factor for choosing right battery according to the application.

-There are many factors included for choosing right battery according to our application. If we want to use battery for longer duration without charging it, we can use secondary battery. We can use primary batteries in disposable kinds of devices. Choosing a right battery with right temperature helps us to reduce the risk of thermal runaway. We can also choose battery according to their energy density, safety and durability. Energy density refers to the total amount of energy stored in the battery per unit volume.

1. Explain types of combination of cell in details.

- The types of combination of cell are series combination and parallel combination. In series connection of cells one positive terminal of each cell is connected to other netative terminal of cell. In parallel combination of cells cells are connected in parallel such that cathode or anode meet at a point.

1. Explain working of capacitor in details.

- Capacitor is made of two parallel layer. One plate is attached to the positive end and the second plate is connected to the negative end when a DC voltage source is placed across the capacitor plate I becomes positive in relation to plate II when the battery's voltage is applied across the capacitor. The current tries to pass through the capacitor from its positive plate to its negative plate in the steady-state condition. However, due to the separation of them with an insulating layer, it is unable to flow. In Capacitor, an electric field appears between the parallel plates. The positive charge is collected on the plate connected to the positive terminal of the battery, while the negative charge is collected on the plate connected to the negative terminal of battery. After a certain point, the capacitor's capacitance with respect to this voltage allows it to collect the maximum amount of charge. The capacitor's charging time is defined as the time it takes to charge the capacitor.

1. Explain characteristics of capacitor.

- The different characteristic of capacitor are listed below :

i) Nominal Capacitance

Capacitance refers to the amount of electrical energy a capacitor can store within it electromagnetic field. The value is represented in the unit farad, including pico-farad (pF), nano-farad (nF) and micro-farads (uF).

ii) Working Voltage.

The working voltage is the maximum amount of voltage a capacitor can receive continuously without damage or failure.

iii) Tolerance

The capacitance value listed for a capacitor can sometimes vary more or less. The value can only vary by a certain range to be accepted, which is its tolerance.

iv) Leakage current

A capacitor contains a non- conductive material known as a dielectric. The dielectric will typically allows a small amount of electricity through, referred amount of electricity through, referred to as leaking.

v) Working Temperature (T)

Temperature affects a capacitors ability to store electrical energy. For example, extremely high temperature can cause a liquid electrolyte in an electrolytic converter to evaporate and change the capacitance.

vi) Temperature Coefficient.

The temperature coefficient measure the change in capacitance that could occur within a particular temperature range.

vii) Polarization

This refers to the change of the plates within a capacitor. In most capacitors there is a positive end and a negative end, similar to a battery.

viii) Equivalent series Resistance

This is a term for the total resistance of every part of a capacitor that resists, rather than conducts electric current.

1. Explain factor affecting capacitance of capacitor.

- The factor affecting capacitance of capacitor are listed below :

i) Plate Area

All other factors being equal, greater plate area gives greater capacitance. Less plate area gives less capacitance.

ii) Plate Spacing

All other factors being equal, further plate spacing gives less capacitance closer plate spacing gives greater capacitance.

iii) Dielectric materials.

All other factors being equal, greater permittivity of the dielectric gives greater capacitance, less permittivity of the dielectric gives less capacitance.

1. Explain connection of capacitor.

- There are mainly two types of connection of capacitors. They are :

i) Series Connection

In this combination of connection one end of a capacitor is connected to the other opposite end of second capacitor. In this combination of capacitor voltage is not increased.

ii) Parallel Connection

In this combination of capacitor, same poles of different capacitor are connected in one point and another end is connected to other single point. It increases the voltage.