Assignment

Course title: Electronics
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Q1: Electronics components are widely used in the field of communication. Specify those equipment in which electronics components are used and describe the role of electronics in modern world technology?

Ans: • **Resistor:**

A resistor is an electrical component that restricts the flow of current in the circuit. A resistor can also be used to afford a specific voltage to a transistor. when current fllows through the resistor, ther resisotor absorbs the electoical energy and degenerates it in the form of heat. Resistors may have variable or fixed resistances which can be found in thermistors, photoresistors, trimmers, Varistors, potentiometers, and hamsters. The current flow through the resistors is directly propotional to the voltage across the resistor terminals. The relationship is represented by ohm's law.

• **Capacitor:**

A capacitor is a two terminal linear passive component that is made from two conductive plates within an insulator between

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them. The main function of capacitor is that it stores electrical energy when an electric charge is forced onto its terminals from a power source. In a timing circuit a capacitor is used with a resistor and also can be used as a filter to allow the Ac signals and block the DC signals.

- **Microcontroller:**

A microcontroller is a small computer on a single integrated circuit that assembles all the features that are found in the microprocessor. In order to serve different application, it has a high concentration of on chip amenities such as ram rom timers I/O ports, serial port, interrupts and clock circuit.

- **Inductor:**

An Inductor or coil or a reactor is a two-terminal passive electrical component. The main function of an Inductor is that it stores electrical energy in the form of magnetic energy

- **Transformer:**

A transformer is an electrical device that consists of two coils of wire

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that are linked by an iron core. It offers the much needed capability of changing the current and voltage level easily. The main function of transformer is to increase or decrease Ac voltages.

- **Battery:**

A Battery is an electrical device that is used to convert chemical energy into electrical energy through electrochemical discharge reactions. It is composed of one or more cells wherein each cell has an anode (+), the cathode (-) and the electrolyte.

- **Fuse:**

A fuse is a material or piece of wire which is used to protect the components from destruction due to the excessive current flowing through them. when excessive current flows through the circuit, the wire gets heated up and get damaged. As a result the current stops flowing.

- **circuit Breakers:**

A circuit breaker is a mechanical switching device which is operated automatically and is used to protect the electrical circuit from the damage caused by overload or short circuit. The main function of circuit breaker is to interrupt

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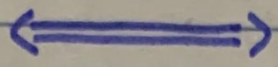
the current flow and to Identify a fault condition.



Q2: Explain working principal of P-N junction diode in forward and reverse biased condition?

Ans: PN- junction Diode The effect of adding this additional energy source results in the free electrons being able to cross the depletion region from one side to Another. The behavior of the PN junction with regards to the potential barrier's width produces an asymmetrical conducting two terminal device, better known as the PN junction Diode.

• PN Junction in Forward Biased:

when a diode is connected in a forward Biased condition, a negative voltage is applied to the N-type material and positive voltage is applied to the P-type material. If this external voltage becomes greater than the value of the potential barrier, approx. 0.7 volts for silicon and 0.3 volts for germanium, the potential barriers opposition will be overcome and current will start to flow. This is because the negative voltage pushes or repels electrons towards the junction giving them the energy to cross over and combine with the holes being pushed in the opposite direction

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towards the junction by the positive voltage. This results in a characteristics curve of zero current flowing up to this voltage point called the "knee" on the static curves and than a high current flow through the diode with little increase in the external voltage.

- **PN junction in Reversed Biased:**

When a diode is connected in a Reversed Biased condition, a positive voltage is applied to the N-type material and a negative voltage is applied to the P-type material. The positive voltage applied for the N-type material attracts electrons towards the positive electrode and away from the junction, while the holes in the P-type end are also attracted away from the junction towards the negative electrode. The net result is that the depletion layer grows wider due to a lack of electrons and holes and presents a high impedance path, almost an insulator. The result is that a high potential barrier is created thus preventing current from flowing through the semiconductor material.

Q3: Differentiate between the following.

- Intrinsic semiconductor.

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- Doped semiconductor.
- carriers movement.

Ans: **Intrinsic Semiconductor:**

Semiconductors that are chemically pure, in other words, free from impurities are termed as intrinsic-semiconductors. The number of holes and electron is therefore determined by the properties of the material itself instead of the impurities. In intrinsic semiconductors, the number of excited electrons is equal to the number of holes i n=p. They are also termed as undoped semiconductors or i-type semiconductors. Silicon and germanium are examples of i-type semiconductors. These elements belong to the IVth group of the periodic table and their atomic numbers are 14 and 32 respectively.

- **Doped semiconductor:**

Pure silicon or germanium are rarely used as semiconductors practically usable semiconductor must have controlled quantity of impurities added to them. Addition of impurity will change the the conductor abillity and it acts as a semiconductor. The process of adding an impurity to an intrinsic or pure material is called doping and the impurity is called a dopant. After doping, an intrinsic material becomes

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an extrinsic material. Practically only after doping these materials become usable.

- **Carriers Movement:**

1= Carriers move freely about the semiconductor lattice in a random direction at a certain velocity determined by the temperature and the mass of the carriers.

2= Carriers will continue in that direction until they collide with another semiconductor lattice atom.

3= There is no net overall movement of carriers in any direction. Electrons in the conduction band and holes in the valence band are considered "free" carries in the sense that they can move throughout the semiconductor lattice that makes up the crystal structure of the material. A simple but in most cases adequate description of carrier movement views each carrier as moving in a random direction at a certain velocity.

The carrier moves in this random direction for a distance called the scattering length. before colliding with a lattice atom. once the collision takes place, the carrier moves away in a different random direction.