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ELECTRONICS AND COMMUNICATIONS

GENERAL SCIENCE

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ELECTRONICS

INTRODUCTION

- Electronics has become a part of **our daily life**. **All gadgets** like mobile phones, computers, televisions, music systems etc work on the electronic principles.
- **Electronic circuits** are used to perform various operations in devices like **air conditioners, microwave oven, dish washers** and **washing machines**.

EVOLUTION OF ELECTRONICS

- The history of electronics began with the invention of vacuum diode by **J.A. Fleming** in 1897. This was followed by a **vacuum triode** implemented by **Lee De** Forest to amplify electrical signals.
- This led to the introduction of tetrode and pentode tubes. Subsequently, the transistor era began with the invention of bipolar junction transistor by Bardeen, Brattain and Shockley in 1948 for which **Nobel prize** was **awarded in 1956**.

Insulators

- The energy band structure of insulators is shown in Figure. The **valence band** and the conduction band are separated by a **large energy gap.**
- For metals, the resistivity value lies between $\mathbf{10^{-2}}$ and $\mathbf{10^{-8}}$ **Ωm**.

Semiconductors

- In semiconductors, there exists a **narrow forbidden energy** gap ($\mathbf{E_g}$ **<3eV**) between the valence band and the conduction band.
- At a **finite temperature**, thermal agitations in the solid can break the covalent bond between the atoms (covalent bond is formed due to the sharing of electrons to attain stable electronic configuration).

TYPES OF SEMICONDUCTRORS

- **Intrinsic semiconductors**
- **Extrinsic semiconductors**
- **n-type semiconductor**
- **p-type semiconductor**

DIGITAL ELECTRONICS

- Digital Electronics is the sub-branch of electronics **which deals with digital signals**.
- It is increasingly used in **numerous applications** ranging from high end processor circuits to miniature circuits for signal processing, communication etc.

Analog and Digital Signals

- There are **2 different types** of signals used in Electronics.
  - **Analog signals** and
  - **Digital signals**.

LOGIC GATES

- A logic gate is an **electronic circuit** which functions based on **digital signals**.
- The logic gates are considered as the **basic building blocks** of most of the digital systems. It has one output with one or more inputs.

TYPES OF BASIC LOGIC GATES

- **AND**
- **OR**
- **NOT**

COMMUNICATION

INTRODUCTION

- Communication exists since the dawn of life in this world. Growth in **science and technology** removed the locational **disadvantage effectively**.
- Right from the developments made in communication by great scientists like **J.C. Bose, G. Marconi,** and **Alexander Graham Bell**, communication has witnessed leaps and bounds.

MODULATION

- The transmission of information through short distances does not require **complicated techniques.**
- There are 3 types of modulation based on which parameter is modified. They are
  - (i) amplitude modulation
  - (ii) frequency modulation
  - (iii) Phase modulation.

THE ELEMENTS OF AN ELECTRONIC COMMUNICATION SYSTEM

- Electronics plays a **major role** in communication. Electronic communication is nothing but the transmission of sound, text, pictures, or data through a medium.
- Long distance transmission uses **free space** as a medium.

ANTENNA SIZE

- Antenna is used at both transmitter and receiver end. Antenna height is an important parameter to be discussed. The height of the antenna must be a multiple of $\frac{\lambda}{4}$

PROPAGATION OF ELECTROMAGNETIC WAVES

- The **information signal modulated** with the **carrier wave** (radio wave) is **transmitted by an antenna**. This travels through space and is received by the receiving antenna at the other end.
- The electromagnetic wave transmitted by the transmitter travels in three different modes to reach the receiver according to its frequency range:
  - **Ground wave propagation**
  - **Sky wave propagation**
  - **Space wave propagation**

FIBRE OPTIC COMMUNICATION

- The method of **transmitting information** from one place to another in terms of **light pulses** through an optical fiber is called fiber **optic communication**.

INTERNET

- Internet is a **fast growing technology** in the field of communication system with multifaceted tools.

GLOBAL POSITIONING SYSTEM

- GPS stands for **Global Positioning System**. It is a global navigation satellite system that offers **geolocation** and time information to a GPS receiver anywhere on or near the Earth. GPS system works with the assistance of a satellite network.