IIT-JEE / MEDICAL

PHYSICS

KEY TERMS

Electronic Devices

By

BHARAT BHUSHAN @ B. K. NAL
Assistant Professor (Computer Science)
Director, BSTI, Kokar

&

SUPRIYA BHARATI
Assistant Professor (Computer Science)
Asst. Director, BSTI, Kokar

Buddha Science & Technical Institute
Kokar, Ranchi-834001, Jharkhand, India
www.bharatsir.com

1. **Crystalline Solids.** The solids in which atoms are arranged in a regular and periodic manner are known as crystalline solids.
2. **Amorphous Solids.** The solids in which atoms are arranged in a completely irregular manner are known as amorphous solids. They are also known as glassy solids. For example: Glass, talc powder, rubber, plastics etc
3. **Single Crystal.** The crystal in which the periodic arrangement of atoms or molecules extends throughout the piece of the crystal is known as single crystal Single crystals are anisotropic in nature..
4. **Poly crystals.** The aggregate (group of large number) of the mono crystals whose developed faces are joined together forms a crystal known as poly crystal Poly crystals are isotropic in nature.
5. **Liquid Crystals.** Certain organic crystalline solids, which turn into fluids and retain their anisotropic behaviour on heating are called liquid crystals.
6. **Valence Band.** The energy band occupied by the valence electrons is **valence band** and is the highest filled band.
7. **Conduction Band.** The valence band and conduction band in a solid are usually separated by a definite energy gap. Electrons cannot have energy corresponding to this energy gap and hence it is known as forbidden energy gap.
8. **Forbidden Energy Gap.** The valence band and conduction band in a solid are usually separated by a definite energy gap. Electrons cannot have energy corresponding to this energy gap and hence it is known as forbidden energy gap.
9. **Semiconductors.** The solids which have conductivity in between that of conductors and insulators are called semiconductors. The conductivity of semiconductors varies from $10^5 Sm^{-1}$to 1 or 10^0 Sm^{-1}.
10. **Intrinsic semiconductors.** Pure semiconductors are known as **intrinsic semiconductor.**
11. **Doping.** The process of adding impurities in the intrinsic semiconductor is called doping.
12. **Doped or Extrinsic (impure) semiconductor.** A semiconductor obtained after adding impurity atoms in the intrinsic semiconductor is called extrinsic or doped semiconductor.
13. **P-type or p-type Semiconductor.** When trivalent impurity is added to atoms pure germanium or silicon crystal, we get extrinsic semiconductor known as –type semiconductor.

14. **N-type or n-type Semiconductor.** When pentavalent impurity atoms are added to pure germanium or silicon crystal, we get extrinsic semiconductor known as N-type semiconductors.
15. **Depletion Layer.** The region around the junction (where both p-and n-type semiconductors meet) has no mobile charge, is known as depletion region or depletion layer. The thickness of depletion layer is about 10^{-3}mm or10^{-6}m.
16. **Barrier potential.** A potential difference is set up across the junction which opposes the further diffusion of electrons and holes through the junction, this potential difference is called barrier potential (V_b).
17. **Forward Bias.** When a battery of e.m.f. greater than the barrier potential (V_b) is connected to a p-n junction diode in such a way that the positive terminal of the battery is connected to p-region and the negative terminal of the battery is connected to the n- region of the junction diode, then the p-n junction diode is said to be forward biased.
18. **Reverse Bias.** A p-n junction is said to be reverse biased when the positive terminal of the battery is connected to the n- region and negative terminal is connected the p region of the p-n junction diode.
19. **D.C. or Static resistance**. of the diode is defined as the ratio of the d. c voltage across the diode to the direct current flowing through it i.e R_{dc} or $R_s = V/I$.
20. **A.C. or Dynamic resistance** of the diode is defined as the ratio of the small change in voltage to the corresponding small change in current in the diode i.e. R_{ac} or $R_d = \Delta V / \Delta I$.
21. **Rectifier.** A device which converts alternating current (a .c.) into direct current (d .c.) called rectifier.

    The process of converting a.c. into d.c. is called rectification.
22. **Zener Diode.** A properly doped p-n junction diode which may work even in the breakdown region is called zener diode.
23. **Junction Transistors.** Ordinarily, a junction transistor is a three terminal semiconductor. A transistor is formed when a thin layer of one type of the extrinsic semiconductor (p-or n type) is sandwiched between two thick layers of other type of extrinsic semiconductor.
24. **Amplifier.** A device which increases the amplitude of the input signal is called **amplifier.**

25. A.C. Current Gain (β). It is defined as the ratio of the small change in collector current(ΔI_c) to the small change in base current (ΔI_b) at constant collector – emitter junction voltage.

i.e. $$\beta_{a.c.} = \left(\frac{\Delta I_c}{\Delta I_b}\right)_{V_{CE}=\text{constant}}$$

26. Resistance gain is defined as the ratio of the output resistance to the input resistance

i.e. $$\text{Resistance gain} = \frac{R_0}{R_i}$$

27. Voltage gain is defined as the ratio of small change in the output voltage to the small change in the input voltage.

i.e. $$A_v = \frac{\Delta V_0}{\Delta V_i}$$

28. Power gain is defined as the ratio of small change in the output power (ΔP_0) to the small change in the input power (ΔP_i).

i.e. $$\text{Power gain} = \frac{\Delta P_0}{\Delta P_i}$$

29. Tranconductance (g_m) is defined as the ratio of small change in the output current (i.e. collector current) to the corresponding small change in the input voltage (V_b)at constant output voltage (V_c).

i.e. $$g_m = \left.\frac{\Delta I_o}{\Delta V_i}\right|_{V_o=\text{constant}} \quad \left.\frac{\Delta I_c}{\Delta V_b}\right|_{V_c=\text{constant}}$$

30. Oscillator is a device which delivers a.c. output waveform of desired frequency from d.c power even without input signal excitation.

31. Logic Gates & Truth Table. The digital circuit that can be analysed with the help of Boolean algebra is called logic gate or logic circuit. A logic gate has two or more inputs but only one output.

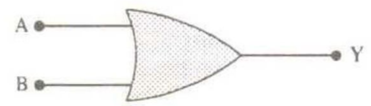
There are primarily three logic gates namely the **OR** gate, the **AND** gate and the **NOT** gate

32. Truth Table. The operation of a logic gate or circuit can be represented in a table which contains all possible inputs and their corresponding outputs is the truth table .

33. The OR gate. It has two inputs (A and B) and only one output (Y).

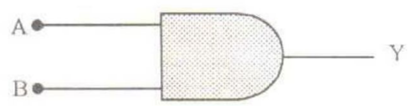
The relation between the output (Y) and the inputs (A and B) is given by Boolean expression.

Y = A + B and is read as "Y equals A **OR** B".



34. The AND Gate. It has two inputs and only one output.

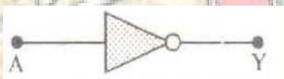
The relation between inputs (A and B) and the output (Y) is given by the Boolean expression **Y = A . B** and is read as ' Y equals A **AND** B.



35. The NOT gate . The NOT has only input and only one output.

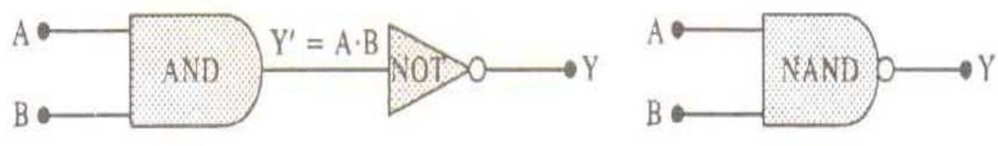
The relation between input (A) and output (Y) is given by Boolean expression

$$Y = \overline{A}$$



and is read as Y NOT equals to A.

36. The NAND gate. The NAND gate is basically a NOT-AND gate. The logic gate in which the output of the AND gate is given to the input of NOT gate is called the NAND gate (Figure A)



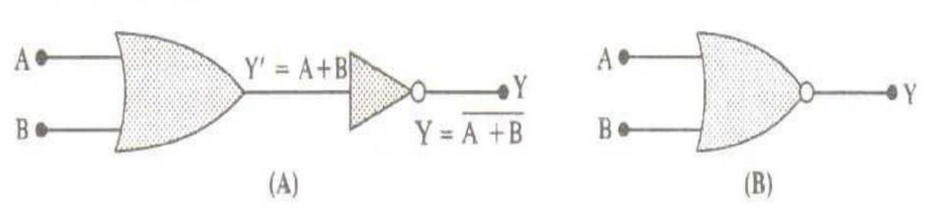
(A) (B)

The Symbolic representation of NAND gate is shown in Figure B.

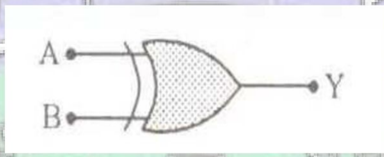
37. The NOR gate. The NOR gate is a NOT – OR logic gate.

The logic gate in which the output of the **OR** gate is given to the input of NOT gate is called the NOR gate (Figure A). The symbolic representation of the NOR gate is shown in Figure (B).

The Boolean expression for the NOR gate is given by : $Y = \overline{A + B}$



38. The XOR Gate. The logic gate which gives high output (i.e., 1) if either input A or input B but not both are high (i.e., 1) is called exclusive **OR** gate or the **XOR** gate.



Note : if any mistake on this, kindly inform on the mail id :

bknal1207@gmail.com

Your Observation! Our Correction !!

1.