Chapter- 14

Semiconductor Electronics: Materials, Devices And Simple Circuits

1 mark questions

01. What is the order of the energy gap in a semiconductor? ***[CBSE-1996]***

02. At what temperature would an intrinsic semiconductor behave like a perfect insulator?***[CBSE-1999]***

03. How is a sample of an n-type semiconductor electrically neutral though it has an excess of negative charge carriers. ***[CBSE-2002]***

04. What happens to the width of the depletion layer of a p-n junction when it is (i) forward biased (ii) reverse biased. ***[CBSE-2006]***

05. Give the ratio of the number of holes and no. of conduction electrons in an intrinsic semiconductor.***[CBSE-2009]***

06. In a semiconductor, the concentration of electron is 8×10^{13} cm^{-3} and that of holes is 5×10^{12} cm^{-3}. Is it a p-type or n-type semiconductor?***[CBSE-1995]***

07. Draw the energy band diagram of a p-type semiconductor.***[CBSE-1999]***

08. Draw the energy band diagram of an n-type semiconductor.***[CBSE-1997]***

09. State the factors which control (i) Wavelength of light

(ii) The intensity of light, emitted by the LED.***[CBSE-1997]***

10. How is the bandgap E_g, of photodiode related to the maximum wavelength λ_m, that can be detected by it?***[CBSE-1996]***

11. State the reason why GaAs is most commonly used in making a solar cell. ***[CBSE-1996]***

12. Draw the circuit diagrams showing how the p-n junction diode is (a) forward biased and (b) reverse biased.

13. What happens to the width of the depletion layer of a p-n junction when it is (a) forward biased, (b) reverse biased?

14. Draw the circuit diagram of an illuminated photodiode in reverse bias. How is photodiode used to measure light intensity?

15. What do you mean by drift and diffusion in current with p-n junction? ***[CBSE-2000]***

16. If the input frequency is 60 Hz. What is the output frequency in ***[CBSE-1996]***

(i) halfwave rectification

(ii) full-wave rectification.

17. Explain the term dynamic resistance of diode with the help of v ~ I graph.***[CBSE-1998]***

2 marks questions

18. Mention a few advantages of a semiconductor device.***[CBSE-1996]***

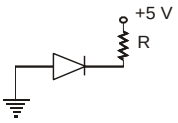
19. Why do we say that an intrinsic semiconductor is like an insulator at 0 K? ***[CBSE-1999]***

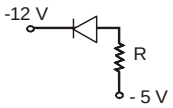
20. Suppose a pure silicon crystal has $5x10^{28}$ atoms per m^3. It is doped by 1 ppm concentration of pentavalent arsenic calculate the no. of electrons & holes. Given that $n_i=1.5x10^{16}\ m^{-3}$. ***[CBSE-2005]***

21. Compare n-type & p-type semiconductor.***[CBSE-2000]***

22. What is the forward biasing of the p-n junction? Why current is high in forward bias?***[CBSE-1996]***

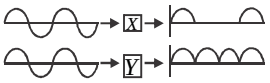
23. Discuss whether the diode is forwardly or reverse bias in the following cases.***[CBSE-1998]***

(i) 

(ii) 

24. An a.c signal is fed into two circuits 'X' and 'Y' and the corresponding output in the two cases have the waveforms as shown.

(a) Identify the circuits 'X' and 'Y'. Draw their labeled circuit diagrams. (b) Briefly explain the working of circuit Y. (c) How does the output waveform from circuit Y get modified when a capacitor is connected across the output terminals parallel to the load resistor?



25. What are optoelectronic devices? Name their types?***[CBSE-1999]***

26. Show how the intensity of current varies with illumination intensity in a photodiode. ***[CBSE-2005]***

27. A p-n junction diode is fabricated from a semiconductor with an energy gap (Eg)=2.8 ev. Can we use it to detect a wavelength of $6000A^0$?***[CBSE-2003]***

28. Draw the I vs V characteristics of a solar cell. Why it is taken in the fourth quadrant.

3 marks questions:

29. Explain the formation of conduction & valance band based on band theory. ***[CBSE - 2009]***

30. How the p-n junction is formed? What is the depletion region explain how this region is created?

31. What is reverse biasing of the p-n junction? Why the current is low in reverse bias? Explain how reverse current suddenly increases at breakdown voltage. ***[CBSE - 2006]***

32. Describe the experimental set up to study v-I characteristics of the p-n junction diode. **[CBSE-2012]**

33. Describe the full-wave rectification by the diode.***[CBSE - 2008]***

34. State the principles & working of photodiodes. What is the reason to operate the photodiode in a reversed biased condition? ***[CBSE - 2011]***

35. What is an LED? Explain its action. Give some advantages of LED over conventional incandescent low power lamps. ***[CBSE - 2008]***

36. Explain the three basic processes in a solar cell to generate current. ***[CBSE - 2011]***

5 marks questions:

37. Why is a Zener diode considered as a special purpose semiconductor diode? Draw the I -V characteristics of a Zener diode and explain briefly how reverse current suddenly increases at the breakdown voltage. Describe briefly with the help of a circuit diagram how a Zener diode works to obtain a constant dc voltage from the unregulated dc output of a rectifier.