Semi Conductors

1. Define current amplification factor of a transistor. What is the change in the collector current, in a transistor of A.C. current gain 150, for a 100 μA change in its base current?

2. The output of an OR gate is connected to both the inputs of a NAND gate. Draw the logic circuit of this combination of gates and write its truth table.

3. What is p-n junction? Explain with the help of a diagram how depletion layer is formed near the junction. Explain also what happens to this layer when the junction is (i) forward biased and (ii) reverse biased?

4. Draw a graph showing the variation of current with voltage for a p-n junction diode.

5. Draw energy band diagrams for an extrinsic semiconductor and indicate the donor and acceptor levels on it.

6. Briefly explain the realization of a NOT gate.

7. Explain the working of a transistor as an amplifier when it is connected in CE configuration.

8. Define the following terms: depletion layer, barrier potential.

9. With the help of diagrams explain how a half wave rectifier and full wave rectifier work. Draw the input and output wave forms.

10. Briefly explain the working of a zener diode. Why does the Zener voltage remain constant even though the current through it varies over a wide range?

11. Differentiate between metals, semiconductors and metals on the basis of
    i) Conductivity
    ii) Energy bands (don't forget to draw energy band diagrams)

12. C, Si and Ge have same lattice structure. Why is C an insulator while Si and Ge intrinsic semiconductors?

13. Differentiate between intrinsic semiconductors and extrinsic semiconductors.

14. Explain why is a doped semiconductor overall electrically neutral.

15. Draw a circuit symbol of a pn junction diode.

16. The output of a full wave rectifier is a pulsating dc voltage, how can you obtain a steadier dc voltage from it?

17. Give a few practical applications that require the use of a transistor.

18. What is a photodiode? What is the reason to operate it in reverse bias?
    Give a practical application of a photodiode.

19. Briefly describe the working on an LED.
    Why should care be taken that high reverse voltages are not applied across LEDs.
    What is the advantage of LEDs over traditional incandescent lamps?

20. Why is the contact of the solar cell chosen as a metal finger electrode? State the criteria for choosing the semiconductor material in a solar cell. Give 2 examples of material used. Give any 2 practical applications of solar cells.

21. In a junction transistor why is the base region generally thin and lightly doped? Why is the emitter heavily doped and the collector moderately doped?

22. Draw circuit symbols for pnp and npn transistors.

23. Briefly explain a practical application of a zener diode.

24. Why is the functioning of a transistor as an amplifier and as a switch called mutually exclusive functions?

25. In the active state of a transistor, why does the emitter-base junction act as a low resistance and the base-collector as a high resistance?

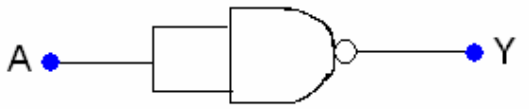
26. How can you obtain the input and output characteristics of a transistor?

27. 'A low input switches the transistor off and a high input switches it on'. Explain how this characteristic is used to operate a transistor as a switch.

28. Explain why output voltage is out of phase with the input voltage when a transistor operates as a CE amplifier.
Write the expression for voltage gain and power gain of the amplifier. The power gain is greater than 1 for a transistor in CE configuration, what is the source of this power?

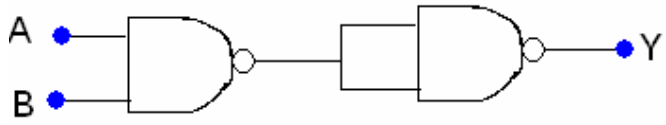
29. State some applications of logic gates.

30. Write the truth table for a NAND gate connected as given in following figure.

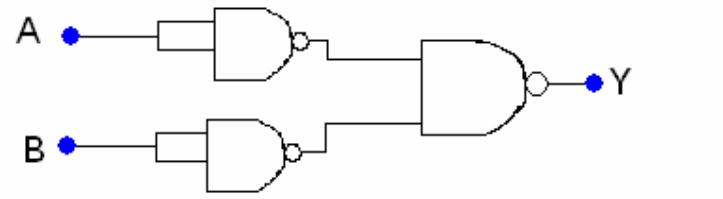


31. Identify the logic operation carried out by the two circuits.

i)



ii)



32. For a CE transistor amplifier, the adio signal voltage across the collector resistance of 2.0kΩ is 2.0V. Suppose the current amplification factor of the transistor is 100, what should be the value of R_B in series with V_{BB} supply of 2.0V if the dc base current has to be 10 times the signal current. Also calculate the dc drop across the collector resistance.