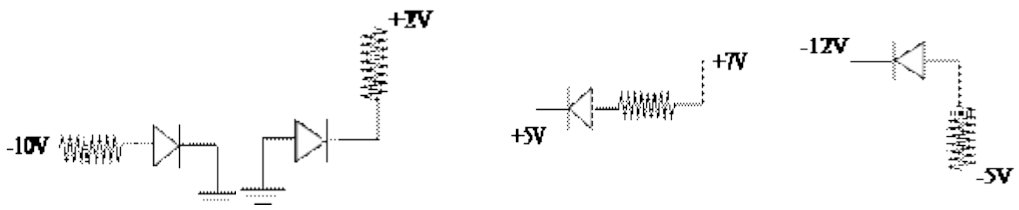
QUESTION BANK (LEVEL-A)

1. Name the two types of extrinsic semiconductors.
2. What are the majority charge-carriers in a n-type semi conductor?
3. What are the majority charge-carriers in a p-type semi conductor?
4. What are the minority charge-carriers in a n-type semi conductor?
5. What are the minority charge-carriers in a p-type semi conductor?
6. Where are additional energy levels formed in n- type semiconductor?
7. Name the additional energy levels formed in n- type semiconductor
8. Where are additional energy levels formed in p- type semiconductor?
9. Name the additional energy levels formed in p- type semiconductor
10. What is the order of energy gap in a semiconductor?
11. What is an intrinsic semiconductor ?
12. Give the ratio of the number of holes and the number of conduction electrons in an intrinsic semiconductor.
13. How does the conductance of a semi conducting material change with rise in temperature?
14. What is depletion layer in p-n junction?
15. How does the thickness of the depletion layer in a p-n junction vary with increase in reverse bias?
16. How does the thickness of the depletion layer in a p-n junction vary with increase in forward bias?
17. What is a logic gate?
18. Draw a circuit symbol of OR gate
19. Draw a circuit symbol of AND gate
20. Draw a circuit symbol of NOT gate
21. Draw a circuit symbol of NAND gate
22. Draw a circuit symbol of NOR gate
23. Write the truth table of AND gate
24. Write the truth table of OR gate
25. Write the truth table of NOT gate
26. Write the truth table of NAND gate
27. Write the truth table of NOR gate
28. Draw energy band diagram for a (i) p- type extrinsic semiconductor (ii) n-type extrinsic semiconductor (iii) intrinsic semiconductors
29. Draw the graph showing the variation of current with voltage for a p-n junction diode in forward bias condition
30. Draw the graph showing the variation of current with voltage for a p-n junction diode in reverse bias condition
31. What is a solar cell? How does it work? Give its one use.
32. The output of an AND gate is connected to both the inputs of NAND gate. Draw the logic circuit of this combination of gates and write its truth table.

33. Draw a circuit for p-n junction diode in forward bias. Sketch the voltage versus current graph for the same.



34. What is an intrinsic semiconductor? How can you convert an intrinsic semiconductor into N-type extrinsic semiconductor?

35. Distinguish between n-type and p-type semiconductors on the basis of energy band diagram.

36. The output of a two input NAND gate is fed to a NOT gate. Write down the truth table for the final output of the combination.

37. Draw the logic symbol of a 2-input NAND gate. Write down its truth table.

38. Draw the logic symbol of a 2-input NOR gate. Write down its truth table.

39. Explain how the depletion layer and barrier potential are formed in a p-n junction diode.

40. With the help of labelled circuit diagram, explain the rectification action of a half wave rectifier.

41. With the help of labelled circuit diagram, explain the rectification action of afull wave rectifier.

42. Draw a circuit diagram to obtain the characteristics of a npn transistor in emitter configuration. Describe how you will obtain input and output characteristics. Give shape of the curves.

43 With a circuit diagram, briefly explain how a zener diode can be used as a voltage regulator.

44. Draw the circuit diagram to show the use of a transistor as an oscillator. State how the positive feedback is provided in the circuit.

45 Draw the circuit diagram to show the use of a transistor as a switch..

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(LEVEL-B)

1. Which biasing will make the resistance of p-n junction high?

2. What is the change in the collector current, in a transistor of a.c. current gain 150, for a 100μA change in its base current?

3. When the voltage drop across a p-n junction diode is increased from 0.65V to 0.70V, the change in the diode current is 5mA. What is the dynamic resistance of the diode?

4. How does conductivity of a semiconductor change with rise in its temperature?

5. . In the given diagram, is the diode D forward or reversed biased?

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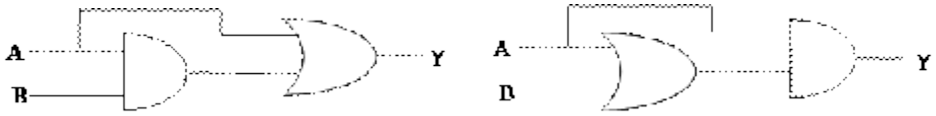
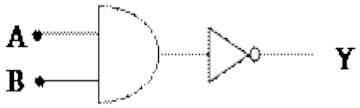
6. Write the truth table for the following combination of gates:



7. . How does the collector current change in a junction transistor, if the base region has larger width?

8. Write the truth table for the combination of gates shown here.

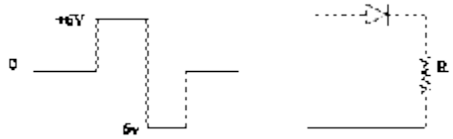


9. How does the width of the depletion region of a p-n junction vary, if the reverse bias applied to it increases?

10. Frequency of input voltage to a half –wave rectifier is 50 Hz. What will be the frequency of the output voltage?

11. Derive a relationship between current gain of common base amplifier and current emitter amplifier.

12. What is an ideal diode? Draw the output waveform across the load resistor R, if the input waveform is as shown in the figure.



13. Write the function of base region of a transistor. Why is this region made thin and slightly doped?

14. If the output of a 2-input NAND gate is fed a the input to a NOT gate (i) name the new logic gate obtained and (ii) write down its truth table.

15. Explain briefly why the output and input signals of a common-emitter amplifier differ in phase by 180^0.

16. Draw the energy band diagram of an N-type semiconductor. How does the forbidden energy gap of an intrinsic semiconductor vary with increase in temperature?

17. 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.

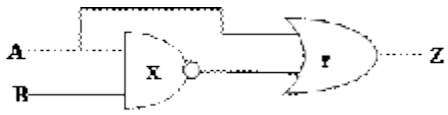
18. Draw a circuit diagram to show the biasing of a n-p-n transistor. Explain the transistor action.

19. 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.

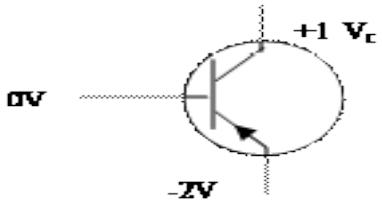
20. Symbolically represent a pnp transistor. Show the biasing of a pnp transistor and explain the transistor action.

21. Draw the circuit diagram of a common-emitter amplifier, with appropriate biasing. What is the phase difference between the input and output signals ?State two reasons why a common-emitter-amplifier is preferred to a common base amplifier.

22. Identify the logic gates marked X and Y in the figure given. Write the truth-table to find the. output at Z for all values of A and B.



23. In the figure given below is (i) the emitter, and (ii) the collector forward or reverse biased? Wi th the help of a circuit diagram, explain the action of a n-p-n transistor.



24. What do you understand by the term “holes” in a semiconductor. Discuss how they move under the influence of electric field.

25. What is a pn junction? How is a pn junction made? How potential barrier is caused into it?

26. By drawing a labeled circuit diagram, explain how a NPN transistor can be used as an amplifier in common base configuration. Find its current gain, voltage gain and power gain.

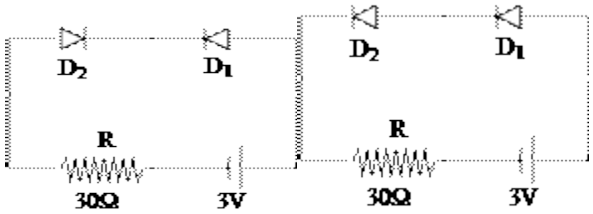
27. In a n type semiconductor, the number of free electron is greater than the number of holes. Does it have net negative charge? Why?

(LEVEL-C)

1. If the emitter and base of n-p-n transistor have same doping concentration, explain how will the collector and base-currents be affected?

2. The input resistance of a CE amplifier is 2KΩ and a current gain is 20. If the load resistance is 5 kΩ, Calculate: (i) the voltage gain of the amplifier and (ii) the trans-conductance of transistor used.

3. Determine the currents through the resistance 'R' of the circuits (i) and (ii), when similar diodes D_1 and D_2 are connected as shown below.



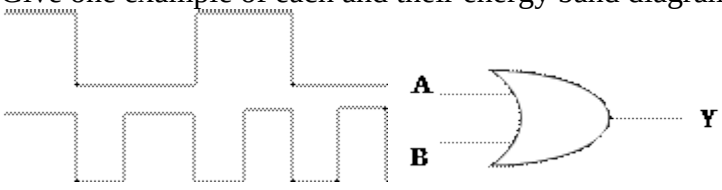
4. Pure silicon at 300 K has equal electron and hole concentrations of $1.5 \times 10^{16}/m^3$. Doping by Indium increases the hole concentration to $4.5 \times 10^{22}/m^3$. Calculate the new electron concentration in the doped silicon.

5. Define the terms 'potential barrier' and 'depletion region' for a p-n junction diode. State how the thickness of depletion region will change when the p.n junction diode is (i) forward biased. (ii) reverse biased.

6. If the base region of a transistor is made large, as compared to a usual transistor, how does it affect (i) the collector current, and (ii)current gain of this transistor? What is the phase difference between the input and output signals of a common emitter amplifier?

7. Draw the energy band diagram of a p-type semiconductor. Deduce an expression for the conductivity of a p-type semiconductor.

8. Explain how an intrinsic semiconductor can be converted into (i)n-type and (ii) p-type semiconductor. Give one example of each and their energy band diagrams.



9. A semiconductor has the electron concentration $0.45 \times 10^{12}/m^3$ and hole concentration $5 \times 10^{20}\ m^{-3}$. Find its conductivity. Given electron mobility = $0.135 m^2 V^{-1}s^{-1}$ and hole mobility $0.048\ m^2V^{-1}s^{-1}$.

10. A semiconductor has equal electron and hole concentrations of $2 \times 10^8/m^3$. On doping with a certain impurity, the hole concentration increases to $4 \times 10^{10}/m^3$. (i) What type of semiconductor is obtained on doping? (ii) Calculate the new electron hole concentration of the semiconductor. (iii) How does the energy gap vary with doping?

11. In a transistor, the base current is changed by 30 μA. This results in a change of 0.03 V in base to emitter voltage and a change of 3 mA in the collector current. (i) Find (a) current gain 'β_{ac}' and (b) transconductance 'gm', (ii) If this transistor is used as an amplifier with the load resistance 7.5 kΩ, calculate voltage gain of amplifier.

12. The input resistance of a silicon transistor is 665 Ω. Its base current is changed by 15 μA which results in change of collector current by 2 mA. This transistor is used as a common emitter amplifier with a load resistance of 5 k Ω. Calculate(i) current gain 'βa.c.', (ii) trans-conductance 'g_m', and (iii) voltage gain 'Av' of the amplifier.
13. 80. In a transistor a change of base current by 20 μA, results in a change of 0.02V in base emitter voltage and a change of 2mA in the collector current, Find (i) current gain 'βa.c.', (ii) trans-conductance 'g_m'. Also calculate the voltage gain of this transistor when used as a common emitter amplifier with a load resistance of 5 kΩ.
14. In a transistor, the flow of current carriers is controlled by which element(s)?

    Emitter ,Collector, Both 1 and 2 above or Base