PHYSICS

BOOKS - MBD -HARYANA BOARD

SOLIDS AND SEMICONDUCTOR DEVICES

Very Short Answer Type Questions

1. How does the junction width change when a p-n junction is forward biased ?

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2. What is depletion region in a p-n junction ?

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3. How does the effective junction potential barrier change when a p-n junction is reverse biased ?

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4. Draw a p-n junction with reverse bias

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5. What is the forbidden energy gap (in joule) for a Germanium crystal ?

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6. Draw ouput waveform of a half wave rectifer.

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

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8. What type of charge carriers are there in p-type semiconductor?

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9. Convert number 29 into binary system.

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10. Convert number 19 into binary system.

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11. In the figure below is : (i) the emitter, (ii) the collector forward or reverse biased ? Justify.

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12. In the figure given below is : (i) the emitter and (ii) the collector forward or reverse biased ? Justify.

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13. What is logic gate ?

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14. What type of impurity is added to obtain n-type semicondutor?

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15. Draw the symbol and truth table of OR gate.

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16. Doping in silicon with indium leads to which type of semiconductor ?

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17. How does the forbidden energy gap of an intrinsic semiconductor vary with the increase in temperature

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18. What are semiconductors? Name any two semiconductors.

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19. In a transistor, give the relation between collector current, base current and emitter current.

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20. Give logic symbol and truth table for a NOT gate.

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21. What conclusion do you draw when a radiation of frequency $10^{16} Hz$ fails to produce photoelectrons from a metal surface?

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22. Write the truth table of $NAND$ gate and NOR gate.

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23. Doping of arsenic in silicon leads to which type of semiconductor?

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24. Why germainum is preferred to silicon for making seimiconductor devices

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25. Write the truth table of AND gate.

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26. What is AND gate ? Draw its truth table.

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27. Draw symbol and truth table for AND gate .

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28. Define current gain in C-B amplifier.

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29. What is the AND gate ?

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30. What is OR gate ?

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31. Convert $(37)_{10}$ into Binary system.

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32. Write the truth table for the circuit shown in the following figure. This circuit acts like

which gate ?

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33. Write the truth table for the circuit shown in the following figure. This circuit acts like which gate ?

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34. Name a simiconductor device whiich can be used as a voltage regualtor

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35. Name the optoelectronic devide used to detect optical signals.

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36. Draw a block diagram of a communication system.

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Short Answer Type Questions

1. What is zener diode ?

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2. Write the truth table for the circuit given below :

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3. What is an intrinsic semiconductor ? Deduce an expression for its electrical conductivity.

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

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

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6. Give main characteristics of holes present in semiconductor.

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

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8. What is a light emitting diode (LED)?

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9. How does the conductivity change with rise of temperature in semi-conductors?

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10. Give main characteristics of intrinsic semiconductors.

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11. What is the difference between n-type and p-type semiconductor?

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12. Explain the difference between intrinsic semiconductors and extrinsic semiconductors.

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13. What is Photodiode ?

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14. How is a potential barrier formed in p-n junction diode ?

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15. How does the junction width change when a p-n junction is forward biased ?

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

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17. Briefly explain the action of p-n-p transistor.

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18. With the help of circuit diagram explain, the working of p-n junction diode as half wave rectifier.

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19. What is a rectifier explain the working of P-N diode as half wave rectifier

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20. Draw the circuit diagram of half wave rectifier, showing input and output voltages.

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21. What is a rectifier ? How a p-n junction diode can be used as a rectifier?

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22. Draw circuit diagram for a full wave rectifier and show input output voltages.

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23. What is a rectifier ? Draw circuit diagram for a rectifier in which ouput is obtained continuously.

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24. What is rectifier explain the working of junction diode as a full wave rectifier diagram

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25. Give any two difference between a half wave rectifier and a full wave rectifier.

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26. Draw a circuit diagram to obtain the characteristics of a n-p-n transistor in common base configuration . Give shape of input and output characteristic curves.

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27. Draw circuit diagram for n-p-n transistor to draw input and output characteristics in common base configuration. Draw the input and ouput curves and explain them.

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28. Explain the input and output characteristics curves for a common emitter transistor.

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29. Draw a circuit diagram to study characteristics of a transistor (pnp or ppn) in common emitter configuration. Draw the

sketch of (i) input characterisitics and (ii) output characteristics for this configuration.

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30. Discuss common-base configuration in amplifier using n-p-n transistor. Calculate its current gain and voltage gain.

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31. Describe n-p-n transistor as an amplifier. Also define current gain and power gain

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32. Explain the use of a junction transistor as an oscillator.

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33. Describe the use of transistor as an oscillator.

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34. Explain the working of transistor as an oscillator using a labelled circuit diagram.

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35. Draw the circuit diagram of transistor as an oscillator and explain its working.

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36. Define current gain α and β for a transistor. How are they mutually related ?

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37. Define current gain in common base and common emitter amplifier and find the relation between them.

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38. Derive relation between current gain in common base and common-emitter transistor amplifiers.

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39. Why is common emitter amplifier preferred over common base amplifier?

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40. Draw a labelled diagram using zener diode for constant voltage power supply.

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41. What do you understand by potential barrier ?

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42. Name the gate obtained from the combination of gates shown in the figure given. Draw its logic symbol and write the truth table of the combination.

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43. Write the truth table for the circuit given in the figure.

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44. Name the gate obtained from the combination of gates shown in the figure given. Draw its logic symbol and write the truth table of the combination.

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45. Can two p-junction diodes placed back to back act as a p-n-p transistor ? If not, why ?

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46. What is the difference between hole current and electron current ?

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47. A n-type semiconductor has a large number of free electrons but still is electrically neutral. Explain.

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48. In a transistor, base is made very thin.Explain.

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49. Draw the V-I characterisitics of p-n junction diode in forward bias and in reverse bias.

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50. Draw the I-V characteristics of a zener diode also sketch the circuit diagram of zenre dioode as a voltage regulator

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51. Write the truth table for given circuit.

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52. What is doping ? Why is it essential ? What are different dopants used ?

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53. How NOR gate is formed ? Draw symbol and truth table for it.

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54. Explain the formation of a NOR gate. Draw its symbol and truth table.

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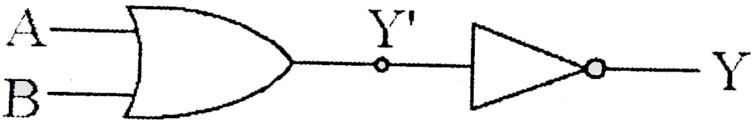
55. 

Name of gate obtained from the combination of gates shown in the figure. Draw its logic symbol. Write the truth table of the combination.

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Long Answer Type Questions

1. Explain, how a CE transistor acts as a switch.

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2. Explain formation of energy band in solids. Distinguish between conductors, extrinsic and intrinsic semi-conductors and insulators on the basis of band theory.

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3. What is an energy band ? How are solids classified in the light of energy bands ?

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4. What are energy bands? Explain the formation of energy bands in case of silicon crystal.

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5. Draw a circuit diagram to study characteristics of n-p-n transistor in CE configuration. Draw the sketch of input and

output characteristics of this configuration .

Define current amplification factor ?

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6. Draw the symbol of a p-n-p transistor. Show the biasing of a p-n-p transistor and explain the transistor action.

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Objective Type Questions

1. Which type of semiconductor is obtained by mixing arsenic with silicon?

A. N

B. P

C. Both

D. None

Answer: A

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2. Conductivity will increase with temperature in :

A. metal

B. non-metal

C. semiconductor

D. None of these

Answer: C

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3. What is the unit of current gain of a transistor?

A. No unit

B. ampere

C. Volt

D. ohm

Answer: A

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4. Which filter circuit is better?

A. π type

B. choke input type

C. capacitor type

D. None of them

Answer: A

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5. Zener diode is used for

A. Amplification

B. Rectification

C. Stabilisation

D. All of them

Answer: C

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6. What is the relation between free electrons n_e, and free holes n_h in intrinsic semiconductor ?

A. $n_e > n_h$

B. $n_e < n_h$

C. $n_e = n_h$

D. None

Answer: C

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7. In a p-n junction depletion region has a thickness of the order of

A. 10^{-12}

B. $10^{-6}m$

C. $1mm$

D. $1cm$

Answer: B

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8. Current gain in common-base configuration in less than 1, because :

A. $I_e < I_p$

B. $I_p < I_e$

C. $I_c < I_e$

D. $I_e < I_c$

Answer: C

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9. The intrinsic semiconductor becomes an insulator at

A. $0^\circ C$

B. $-100^\circ C$

C. $100^\circ C$

D. $0K$

Answer: D

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10. The most commonly used material for making transistor is

A. copper

B. silicon

C. ebonite

D. silver

Answer: B

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11. How many $NAND$ gate are used to from AND gate?

A. 1

B. 2

C. 3

D. 4

Answer: B

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12. A device which converts d.c.into a.c.is called

A. Rectifier

B. Oscillator

C. Amplifier

D. Modulator

Answer: B

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13. Radiowaves of constant amplitude can be generated with

A. Filter

B. Rectifier

C. FET

D. Oscillator

Answer: D

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14. The Boolean expression for NAND gate is.....

A. $A + B = Y$

B. $A.B = Y$

C. $\overline{A} = Y$

D. $\overline{A.B} = Y$

Answer: D

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15. Which of the following gates corresponds to the truth table given below ?

A	B	X
1	1	0
1	0	1
0	1	1
0	0	1

A. NAND

B. NOR

C. XOR

D. OR

Answer: A

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16. $p - n$ junction diode can be used as

A. Rectifier

B. Modulator

C. Demodulator

D. Amplifier

Answer: C

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17. Holes are charge carriers in

A. intrinsic semiconductor

B. p-type semiconductor

C. n-type semiconductor

D. Ionic solids

Answer: B

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18. At absolute zero , Si acts as

A. Non-metal

B. Metal

C. Insulator

D. Semiconductor

Answer: C

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19. A piece of copper and another of germanium are cooled from room temperature to 77 K, the resistance of -

A. each of these decreases

B. copper strip increases and that of germanium decreases

C. copper strip decreases and that of germanium increases

D. None of these

Answer: C

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20. What type of semiconductor is obtained by doping indium with silicon

A. n-type

B. p-type

C. Both n and p type

D. None

Answer: B

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21. What type of semiconductor will be made if Boron is added to Silicon ?

A. p-type

B. n-type

C. None

D. Both n and p type

Answer: A

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