PHYSICS

BOOKS - KUMAR PRAKASHAN KENDRA PHYSICS (GUJRATI ENGLISH)

SEMICONDUCTOR ELECTRONICS : MATERIALS, DEVICES AND SIMPLE CIRCUITS

Section A Try Yourself

1. What is the basic constitutional unit in the electronic circuit?

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2. Why a vacuum tube called a valve in electronics?

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3. What is diode?

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4. How many electrodes are in the tetrode?

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5. Why vacuum is needed in a vacuum tube?

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6. What was used to detect the radio waves?

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7. State the conductivity of metals.

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8. State the resistivity of insulators.

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9. State the conductivity and resistivity of semiconductor.

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10. What are elementary semiconductors?

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11. What is energy band?

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12. Write the definition of valence band and conduction band.

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13. Write the definition of energy gap and forbidden gap.

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14. Write electronic configuration of Si.

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15. Write electronic configuration of Ge.

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16. What is crystalline structure of intrinsic semiconductor?

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17. How does intrinsic semiconductor behave at zero degree kelvin?

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18. How is the holes produces ?

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19. How is electric conduction produced in intrinsic semiconductor?

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20. Write the ratio of the number density of holes and free electron at room temperature in intrinsic semiconductor

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21. Write the formula of total current in intrinsic semiconductor.

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22. How conductivity of intrinsic semiconductor depends on temperatures?

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23. What is impure semiconductor?

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24. What is doping and dopant?

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25. What is the valency of donor impurity? And name these impurities.

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26. What is acceptor impurity? Write the name of such impurities.

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27. What is n-type semiconductor? Name the majority and minority carriers in it.

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28. What is p-type semiconductor? Name the majority and minority carriers in it.

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29. State the value of the difference between E_v and E_C for C, Si and Ge.

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30. Name the primary constitutional unit of semiconductor composition.

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31. Which two important processes occur during the formation of a p-n junction?

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32. What is depletion layer? What is the order of its thickness?

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33. Show the direction of the electric field arises in p-n junction.

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34. What is depletion barrier?

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35. What is forward bias and reverse bias ?

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36. How does the height of potential barrier change in forward bias and reverse bias?

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37. What is breakdown voltage?

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38. What is saturation current?

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39. What is threshold voltage? Write the value of threshold voltage for Ge and Si.

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40. Write the formula and definition of dynamic resistance and also state their approximate values for forward bias and reverse bias.

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41. What is rectification and rectifier?

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42. Why is junction diode used for rectification?

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43. Write the types of rectifier.

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44. How many junction diodes are used for half wave rectifier?

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45. How many junction diodes are used for full wave rectifier?

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46. What is filter circuit?

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47. What type of p-n junction diode does not require forward bias to operate?

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48. What kind of p-n junction diode does not require any kind of bias?

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49. Explain the use of Zener diode as a voltage regulator.

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50. What kind of diode is used as a photo detector?

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51. State the band gap of semiconductor used in the making of LED.

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52. Why is $I \rightarrow V$ characteristic of a solar cell draw in the fourth quadrant of the coordinate system?

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53. What is analog signal?

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54. What is digital signal ? What mathematical method are expressed in it?

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55. What is logic gate?

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56. What is logic gate with one input and one output?

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57. Which is inverter gate?

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58. Write the function of AND gate.

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59. Write the truth table of NAND gate.

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60. NOR gate is combination of which two gates?

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61. What are basic gates?

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62. What are universal gates?

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Section A Questions Answers

1. What are electronics devices? And state is basic types.

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2. Briefly describe the valve in electronics.

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3. Give a brief explanation of solid state semiconductor electronics.

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4. Write the difference between the electronics devices vacuum tube (valve) and the semiconductor.

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5. Classify a solid substance based on electrical conductivity and resistivity.

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6. Give a classification of semiconductors and write examples of each.

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7. Why the motion of electron in solid and in an isolated atom is different ?

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8. Write the definition of valence band and conduction band.

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9. Explain by drawing the energy levels of Si and Ge containing N atoms at 0 K temperature.

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10. Explain conductor (metal), insulator and semiconductor by drawing diagrams based on band.

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11. Explain the crystalline structure by writing the electronic configuration of elementary semiconductors.

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12. Explain the concept of the hole in the semiconductor.

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13. Explain with diagram, how current flows due to electron and hole in pure semiconductor.

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14. Explain the change in the band with the temperature of the intrinsic semiconductor by drawing figure.

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15. Why is it required to add impurity in pure semiconductor? Mention it's condition and explain what are impure semiconductors?

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16. What is n-type semiconductor? Name the majority and minority carriers in it.

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17. What is p-type semiconductor? Name the majority and minority carriers in it.

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18. Explain n and p-type semiconductor based on band theory.

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19. Explain recombination coefficient of intrinsic semiconductor and obtain the relation $n_i^2 = n_e n_h$.

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20. Write four points in distinguishing between p-type semiconductor and n-type semiconductor.

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21. Write the difference between intrinsic and extrinsic semiconductor.

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22. Which is the primary constitutional unit for diode and transistor?

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23. How p-n junction diode is formed ? And explain depletion layer and barrier potential.

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24. What is depletion barrier?

Watch Video Solution

25. Write short on semiconductor diode.

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26. State the methods of connection of p-n junction.

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27. What is forward bias and reverse bias ?

Watch Video Solution

28. When is the p-n junction called reverse bias and explain the change in p-n junction from this type of connection.

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29. What is static characteristic of p-n junction and write its types.

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30. Explain the forward characteristics of the p-n junction diode by drawing circuit and graph.

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31. Explain the reverse characteristics of p-n junction diode by circuit diagram with graph.

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32. What is rectification and rectifier ? Why p-n junction diode is used as a rectifier?

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33. Write the principle of rectifier.

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34. Explain the use of the junction diode as a half wave rectifier by drawing a circuit and draw input and output waves.

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35. Explain the use of junction diode as a full wave rectifier by drawing circuit diagram and draw the form of input and output waves.

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36. Describe the simple filter circuit for obtaining smooth rectified voltage from junction diode rectifier.

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37. Write short note on zener diode.

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38. Explain the use of Zener diode as a voltage regulator.

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39. What are optoelectronic devices? Give the names of such major devices.

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40. Explain construction and working of photodiode.

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41. Explain the design, working, uses and benefits of light emitting diode.

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42. Describe construction, working and use of the solar cell.

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43. What are the ideal materials for fabrication of solar cell? and give the criteria for selection.

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44. What is digital signal ? What mathematical method are expressed in it?

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45. write types of logic system.

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46. What is logic gate?

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47. Write the symbol, truth table, function and Boolean equation for NOT gate.

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48. Write the symbol, truth table, function and Boolean equation for OR gate.

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49. Write the symbol, truth table, function and Boolean equation for AND gate.

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50. What is NAND gate? Write its symbol, truth table and Boolean equation.

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51. What is NOR gate? Write its symbol, truth table and Boolean equation.

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Section B Numericals Numerical From Textual Illustrations

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

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2. Sn, Si and Ge have the same lattice structure . Why Sn is a conductor while Si and Ge are Semiconductor?

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3. Suppose a pure Si crystal has 5×10^{28} atoms m^{-3}. It is doped by 1 ppm concentration of pentavalent As. Calculate the number of electrons and holes. Given that $n_i = 1.5 \times 10^{16} m^{-3}$.

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4. At temperature 300 K number density of electrons and holes in pure silicon is $1.5 \times 10^{16} m^{-3}$. The number density of hole increase by $4.5 \times 10^{22} m^{-3}$ dopping the indium impurity so calculate number denstiy of electron.

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5. Can we take one slab of p-type semiconductor and physically join it to another n-type semiconductor to get p-n junction?

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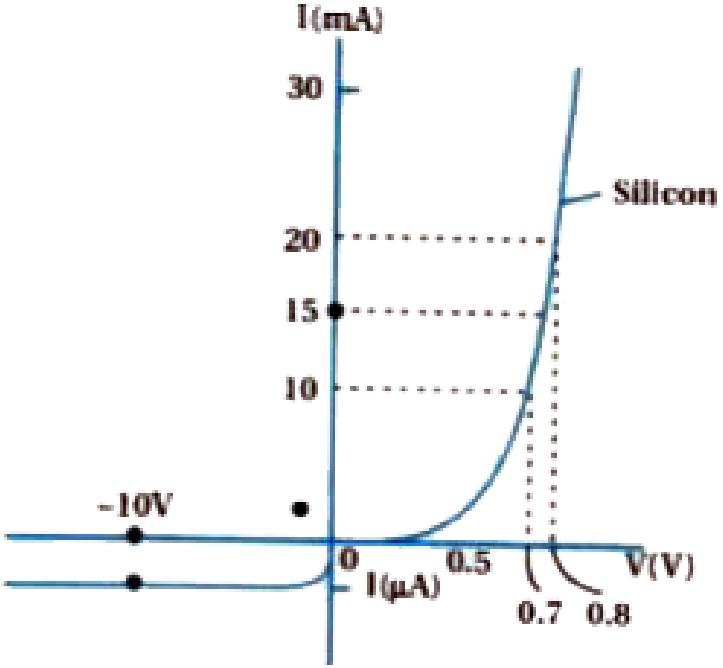
6. The $V \rightarrow I$ characteristic of a silicon diode is shown in the figure. Calculate the resistance of the diode at (a) $I_D = 15mA$ and (b) $V_D = -10V$.



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7. The values of voltage V and current I for a given diode are given in the following table.

	V	I
Forward bias	2.0 V	60 mA
	2.4 V	80 mA
Reverse bias	0 V	0 μA
	– 2.0 V	– 0.25 μA

Find the forward bias resistance and reverse bias resistance for a given diode for a straight line characteristics.

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8. In a Zener regulated power supply a Zener diode with $V_Z = 6.0V$ is used for regulation. The load current is to be 4.0 mA and the unregulated input is 10.0V. What should be the value of series resistor R_S?

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9. The current in the forward bias is known to be more $(\sim mA)$ than the current in the reverse bias $(\sim \mu A)$. What is the reason then to operate the photodiodes in reverse bias?

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10. Why are Si and GaAs are perferred materials for solar cells?

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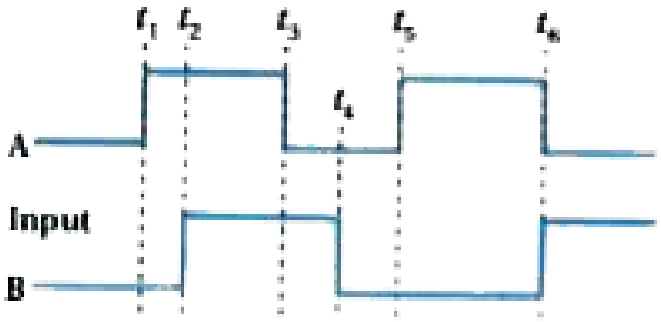
11. Justify the output waveform (Y) of the OR gate for the following inputs A and B given in figure.



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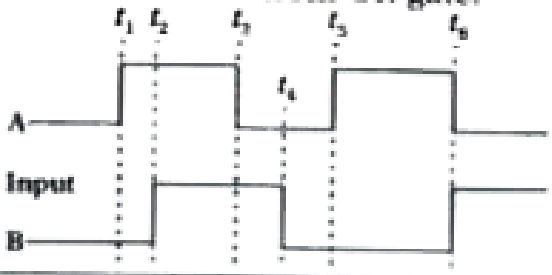
12. The digital signal for the OR gate with two inputs is shown in the figure. Sketch the output waveform obtained from OR gate.

waveform obtained from OR gate.



Time interval	Input A	Input B	Output Y = A + B
For $t < t_1$	0	0	0
For t_1 to t_2	0	1	1
For t_2 to t_3	1	0	1
For t_3 to t_4	1	1	1
For t_4 to t_5	0	0	0
For t_5 to t_6	1	0	1
For $t_6 < t_7$	0	0	0
For $t_7 < t_8$	0	1	1

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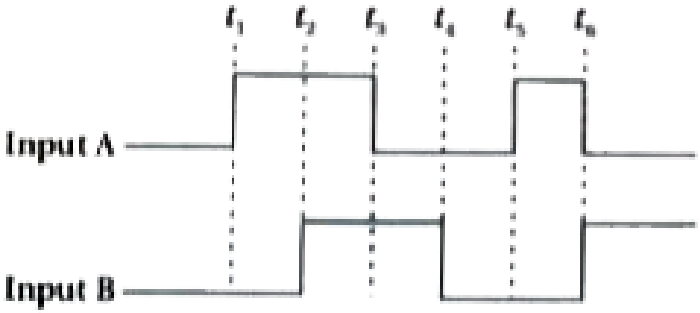
13. As shown in the following figure, take A and B input waveforms.

Sketch the output waveform obtained from AND gate.



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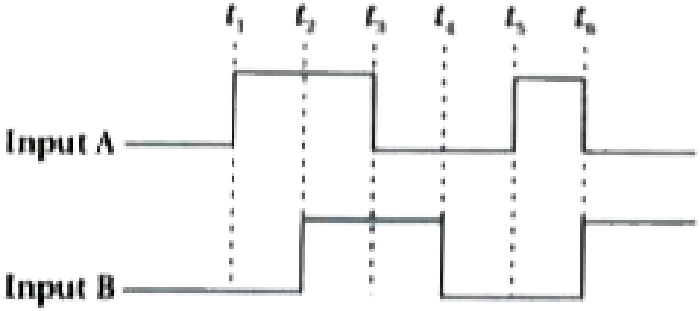
14. As shown in the following figure, take A and B input waveforms.

Sketch the output waveform obtained from AND gate.



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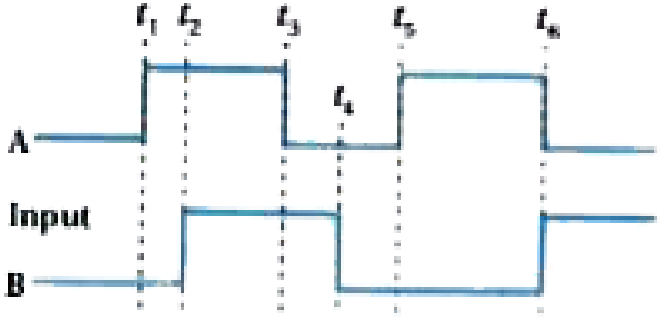
15. Justify the output waveform (Y) of the OR gate for the following inputs A and B given in figure.



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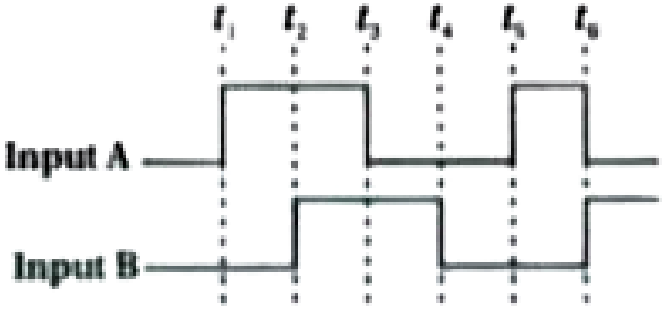
16. As shown in the following figure take A and B input waveforms. Sketch the output waveform obtained from NAND gate.



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Section B Numericals Numerical From Textual Exercise

1. In an n type silicon, which of the following statements is true:

A. Electrons are majority carriers and trivalent atoms are the dopants.

B. Electrons are minority carriers and pentavalent atoms are the dopants.

C. Holes are minority carriers and pentavalent atoms are the dopants.

D. Holes are majority carriers and trivalent atoms are the dopants.

Answer: C

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2. Which of the statements given in Exercise is true for p-type semiconductors.

A. Electrons are majority carriers and trivalent atoms are the dopants.

B. Electrons are minority carriers and pentavalent atoms are the dopants.

C. Holes are minority carriers and pentavalent atoms are the dopants.

D. Holes are majority carriers and trivalent atoms are the dopants.

Answer: D

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3. Carbon, silicon and germanium have four valence electrons each. These are characterised by valence and conduction bands separated by energy band gap respectively equal to $(E_g)_C$, $(E_g)_{Si}$ and $(E_g)_{Ge}$. Which of the following statements is true?

A. $(E_g)_{Si} < (E_g)_{Ge} < (E_g)_C$

B. $(E_g)_C < (E_g)_{Ge} < (E_g)_{Si}$

C. $(E_g)_C > (E_g)_{Si} > (E_g)_{Ge}$

D. $(E_g)_C = (E_g)_{Si} = (E_g)_{Ge}$

Answer: C

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4. In an unbiased p-n junction, holes diffuse from the p-region to n-region because

A. free electrons in the n-region attract them

B. they move across the junction by the potential difference.

C. hole concentration in p-region is more a compared to n-region.

D. All the above.

Answer: C

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5. When a forward bias is applied to a p-n junction, it.....

A. raises the potential barrier.

B. reduces the majority carrier current to zero.

C. lowers the potential barrier.

D. None of the above.

Answer: C

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6. In half wave rectification, what is the output frequency if the input frequency is 50 Hz.

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7. A p-n photodiode is fabricated from a semiconductor with band gap of 2.8 eV. Can it detect a wavelength of 6000 nm?

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8. The number of silicon atoms per m^3 is 5×10^{28}. This is doped simultaneously with 5×10^{22} atoms per m^3 of Arsenic and 5×10^{20} per m^3 atoms of Indium. Calculate the number of electrons and holes. Given that $n_i = 1.5 \times 10^{16} m^{-3}$. Is the material n-type or p-type?

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9. In an intrinsic semiconductor the energy gap E_g is 1.2eV. Its hole mobility is much smaller than electron mobility and independent of temperature. What is the ratio between conductivity at 600K and that at 300K ? Assume that the temperature dependence of intrinsic carrier concentration n_i is given by $n_i = n_0 \exp\left(-\frac{E_g}{2k_B T}\right)$ where n_0 is a constant.

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10. In a p-n junction diode, the current I can be expressed as

$$I = I_0 \exp\left(\frac{eV}{2k_BT} - 1\right)$$

where I_0 is called the reverse saturation current, V is the voltage across the diode and is positive for forward bias and negative for reverse bias, and I is the current through the diode, k_B is the Boltzmann constant $\left(8.6 \times 10^{-5} eV/K\right)$ and T is the absolute temperature. If for a given diode $I_0 = 5 \times 10^{-12}$A and T = 300 K, then

(a) What will be the forward current at a forward voltage of 0.6 V ?

(b) What will be the increase in the current if the voltage across the diode is increased to 0.7 V ?

(c) What is the dynamic resistance?

(d) What will be the current if reverse bias voltage changes from 1 V to 2 V ?

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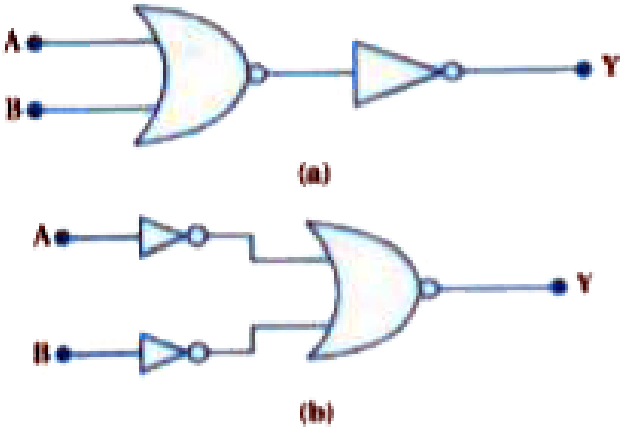
11. You are given the two circuits as shown in figure. Show that circuit (a) acts as OR gate while the circuit (b) acts as AND gate.



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

Hence identify the exact logic operation carried out by this circuit.

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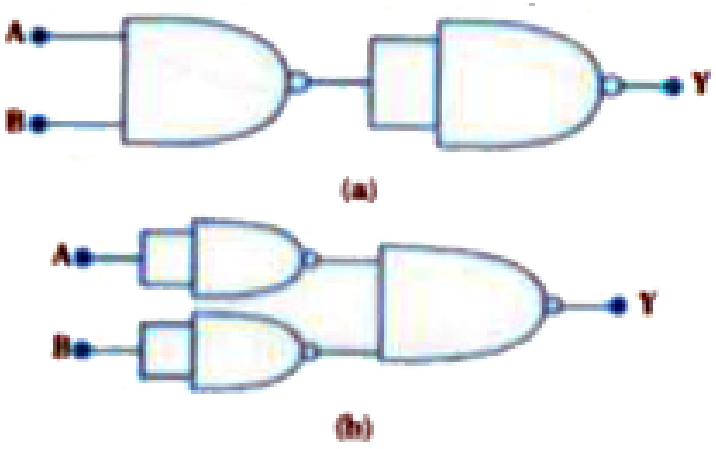
13. You are given the circuits as shown in figure, which consist of NAND gates. Identify the logic operation carried out by the two circuits.



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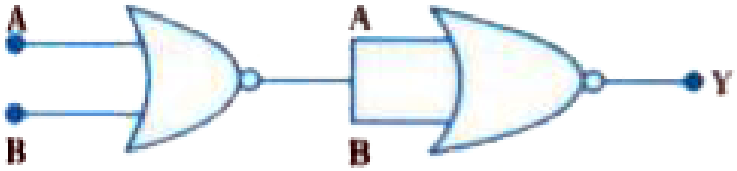
14. Write the truth table for circuit given in figure below consisting of NOR gates and identify the logic operation (OR, AND, NOT) which this circuit is performing.



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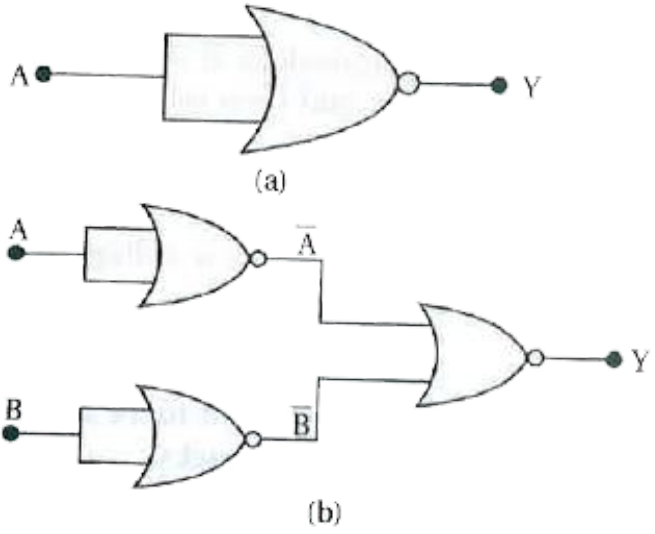
15. Write the truth table for the circuits given in figure consisting of NOR gates only. Identify the logic operations (OR, AND, NOT)

performed by the two circuits.



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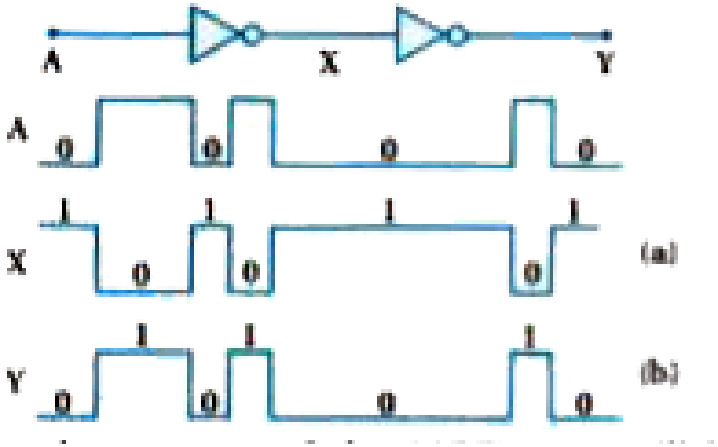
Section B Numericals Numerical From Darpan Based On Textbook

1. A logic circuit is shown in the diagram. Draw the output signal at the point X and Y for the input signal shown in the figure at

point A.



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2. Prepare the truth table for the logic circuit given below.

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3. Which gate will be obtained by joining the two inputs of the NAND gate?

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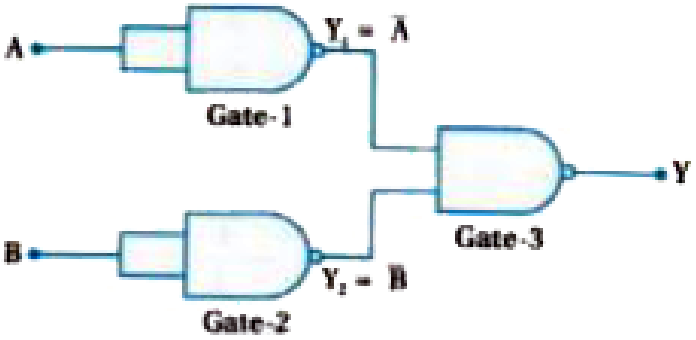
4. Show that the circuit drawn in the figure comprising of 3 NAND gate behaves as an OR gate.



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5. Give truth table for a circuit shown in figure.

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6. A NAND gate of two input has an output is taken as input of NOT gate. Show the circuit of it and give truth-table for final output of combination.

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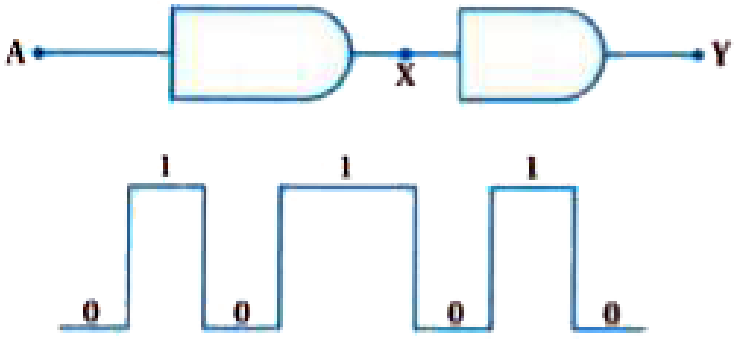
7. A circuit of logic gte made from two AND gate is shown in following figure. Draw output waves for point X. For A and for Y.



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8. The number density of electron is a semiconductor is $8 \times 10^{13} cm^{-3}$ and number density of hole is $5 \times 10^{12} cm^{-3}$ then,

(1) Which type of this semiconductor is?

(2) How much is resistivity of it? (Mobility of electron is 23000 $cm^2 V^{-1} s^{-1}$ and mobility of hole is 100 $cm^2 V^{-1} s^{-1}$ and $e = 1.6 \times 10^{-19} C$)

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9. What amount of inpurity of atomic density in added toform N-type semiconductor in Ge semiconductor of conductivity σ is $5\Omega^{-1}cm^{-1}$ Mobility of electron in N-type semiconductor is 3900 $cm^2V^{-1}s^{-1}$. Ignore conductivity due to hole. $\left(e = 1.6 \times 10^{-19}C\right)$

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10. If an LED has to emit 662 nm wavelength of light then what should be the band gap energy of its semiconductor? $\left(h = 6.62 \times 10^{-34}Js\right)$

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11. The width of a depletion region is 400 nm. The intensity of the electric field at the depletion region is 5×10^5V/m. Then calculate the following quantities: (1) The value of the potential barrier. (2) The minimum energy required by an electron to move from the n-type to the p-type region of the diode.

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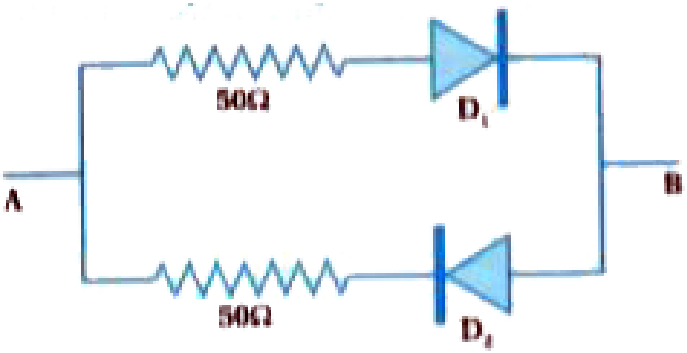
12. For the circuit shown in the figure, calculate the equivalent resistance for the two cases given as : (1) $V_A > V_B$ and $(2) V_B > V_A$. Here consider D_1 and D_2 to be ideal diodes.



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13. Therefore are 6×10^{19} electrons per unit cubic metre of pure semiconductor. What will be the number of holes for this semiconductor of dimension $1cm \times 1cm \times 2cm$?

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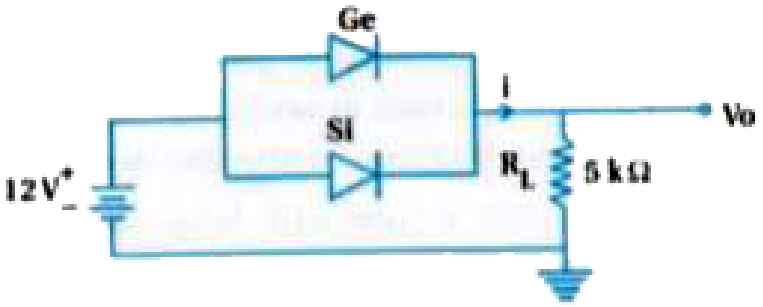
14. (A) Calculate the value of V_0 and i if the silicon and germanium diode start conducting at 0.7 V and 0.3 V respectively.

(B) If the Ge diode connection is now reversed, what will be the new values of V_0 and i ?



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Section C Ncert Exemplar Solution Multiple Choice Qustion Mcqs

1. The conductivity of a semiconductor increases with increase in temperature because

A. number density of free current carriers increases.

B. relaxation time increases.

C. both nomber density of carriers and relaxation time increase.

D. number density of current carriers increases, relaxation time decreases but effect of decrease in relaxation time is much less than increase in number density.

Answer: D

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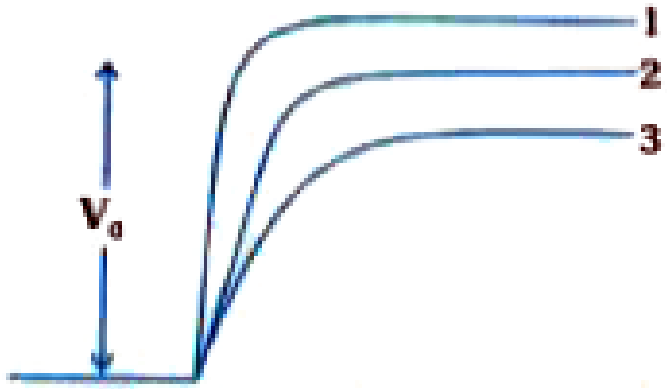
2. 

In figure, V_o is the potential barrier across a p-n junction, when no battery is connected across the junction.

A. 1 and 3 both correspond to forward bias of junction.

B. 3 corresponds to forward bias of junction and 1 corresponds to reverse bias of junction.

C. 1 corresponds to forward bias and 3 corresponds to reverse bias of junction.

D. 3 and 1 both correspond to reverse bias of junction.

Answer: B

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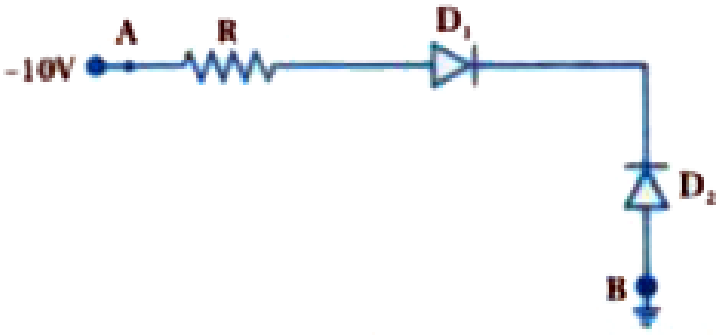
3.



In figure, assuming the diodes to be ideal,

A. D_1 is forward biased and D_2 is reverse biased and hence current flows from A to B

B. D_2 is forward biased and D_1 is reverse biased and hence no current flows from B to A and vice versa.

C. D_1 and D_2 are both forward biased and hence current flows from A to B.

D. D_1 and D_2 are both reverse biased and hence no current flows from A to B and vice versa.

Answer: B

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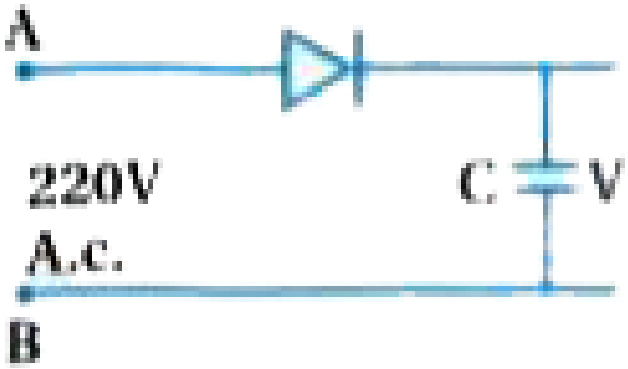
4.



A 220 V A.C. supply is connected betweeen points A and B (See figure). What will be the potential difference V acorss the capacitor ?

A. 200V

B. 110 V

C. 0 V

D. $220\sqrt{2}$ V

Answer: D

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5. Hole is

A. an anti-particle of electron.

B. a vacancy created when an electron leaves a covalent bond.

C. absence of free electrons.

D. an artifically created particle.

Answer: B

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6. 

The output of the given circuit in figure.

A. would be zero at all times.

B. would be like a half wave rectifier with positive cycles in output.

C. would be like a half wave rectifier with negative cycles in output.

D. would be like that of a full wave rectifier.

Answer: C

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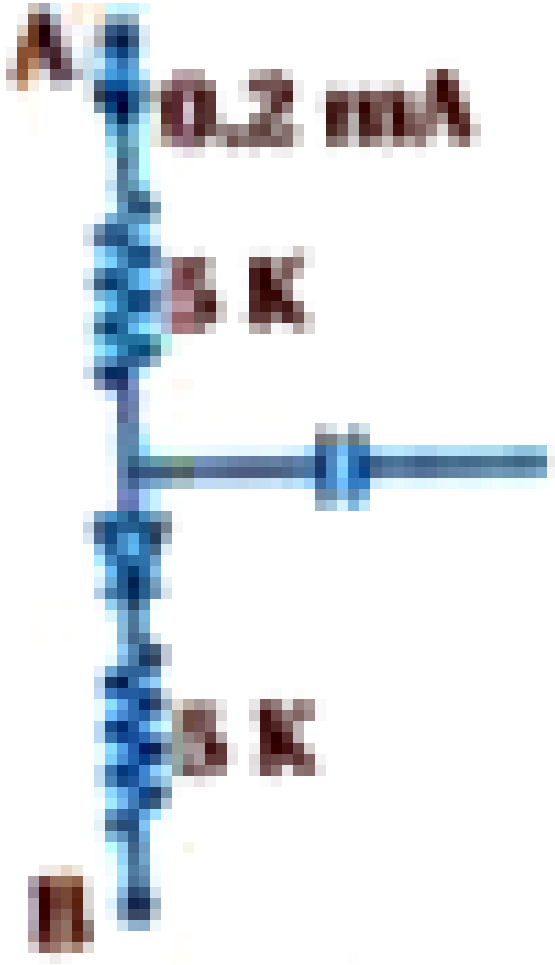
7.



In the circuit shown in figure, if the diode forward voltage drop is 0.3 V, the voltage difference between A and B is

A. 1.3 V

B. 2.3 V

C. 0

D. 0.5 V

Answer: B

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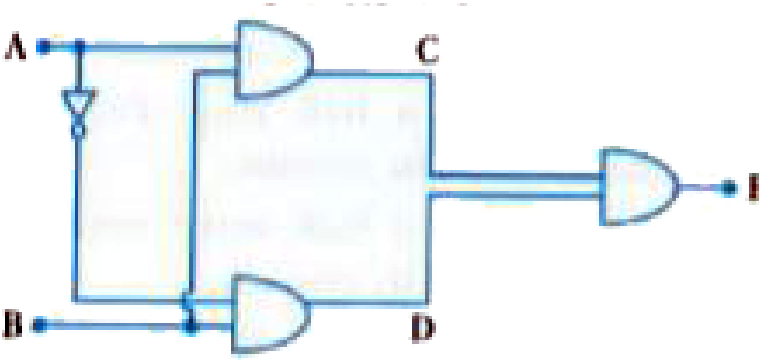
8.



Truth table for the given circuit (See figure) is

A.

A	B	E
0	0	1
0	1	0
1	0	1
1	1	0

B.

A	B	E
0	0	1
0	1	0
1	0	0
1	1	1

C.

A	B	E
0	0	0
0	1	1
1	0	0
1	1	1

D.

A	B	E
0	0	0
0	1	1
1	0	1
1	1	0

Answer: C

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Section C Ncert Exemplar Solution Multiple Choice Qustion More Than One Options

1. When an electric field is applied across a semiconductor

A. electrons move from lower energy level to higher energy level in the conduction band

B. electrons move from higher energy level to lower energy level in the conduction band

C. holes in the valence band move from highest energy level to lower energy level.

D. holes in the valence band move from lower energy level to higher energy level.

Answer: A::C

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2. Consider an n-p-n transitor with its base-emitter junction forward biased and collector base junction reverse biased. Which of the following statements are true?

A. Electrons crossover from emitter to collector.

B. Holes move from base to collector.

C. Electrons move from emitter to base.

D. Electrons from emitter move out of base without going to the collector.

Answer: A::C

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3.

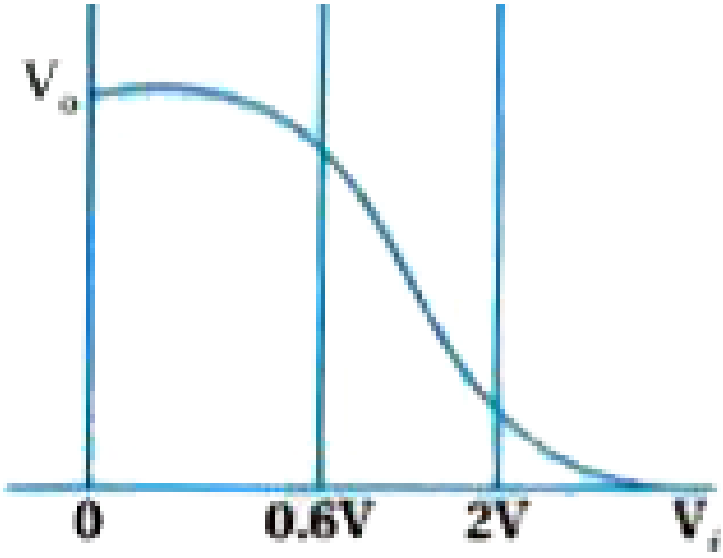

Figure shows the transfer characteristics of a base biased CE

transistor. Which of the following statements are true?

A. At $V_i = 0.4V$, transistor is in active state.

B. At $V_i = 1V$, it can be used as an amplifier.

C. At $V_i = 0.5V$, it can be used as a switch turned off.

D. At $V_i = 2.5V$, it can be used as a switch turned on.

Answer: B::C::D

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4. In a n-p-n transistor circuit, the collector current is 10 mA. If 95 per cent of the electrons emitted reach the collector, which of the following statements are true?

A. The emitter current will be 8 mA.

B. The emitter current will be 10.53 mA.

C. The base current will be 0.53 mA.

D. The base current will be 2 mA.

Answer: B::C

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5. In the depletion region of a diode

A. there are no mobile charges

B. equal number of holes and electrons exist, making the region neutral.

C. recombination of holes and electrons has taken place.

D. immobile charged ions exist.

Answer: A::B::D

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6. What happens during regulation action of a Zener diode?

A. The current and voltage across the Zener remains fixed.

B. The current through the series Resistance (R_s) changes.

C. The Zener resistance is constant.

D. The resistance offered by the Zener changes.

Answer: B::D

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7. To reduce the ripples in a rectifier circuit with capacitor filter

A. R_L should be increased.

B. input frequency should be decreased.

C. input frequency should be increased.

D. capacitors with high capacitance should be used.

Answer: A::C::D

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8. The breakdown in a reverse biased p-n junction diode is more likely to occur due to

A. large velocity of the minority charge carriers if the doping concentration is small.

B. large velocity of the minority charge carriers if the doping concentration is large.

C. strong electric field in a depletion region if the doping concentration is small.

D. strong electric field in the depletion region if the doping concentration is large.

Answer: A::D

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Section C Ncert Exemplar Solution Very Short Answer Type Questions

1. Why are elemental dopants for Silicon on Germanium usually chosen from group XIII on group XV ?

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2. Sn, C, and Si, Ge are all group XIV elements. Yet, Sn is a conductor, C is an insulator while Si and Ge are semiconductors.

Why?

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3. Can the potential barrier across a p-n junction be measured by simply connecting a voltmeter across the junction?

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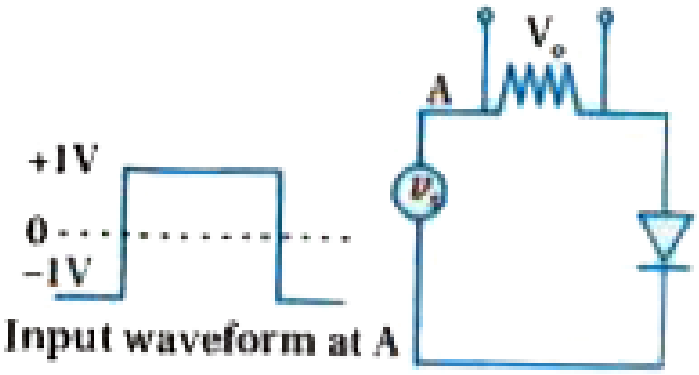
4.



Draw the output waveform across the resistor.

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5. The amplifiers X, Y and Z are connected in series. If the voltage gains of X, Y and Z are 10, 20 and 30, respectively and the input signal is 1 mV peak value, then what is the output signal voltage (peak value)

(i) if dc supply voltage is 10V?

(ii) if dc supply voltage is 5V?

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6. In a CE transistor amplifier there is a current and voltage gain associated with the circuit. In other words there is a power gain. Considering power a measure of energy, does the circuit violate conservation of energy?

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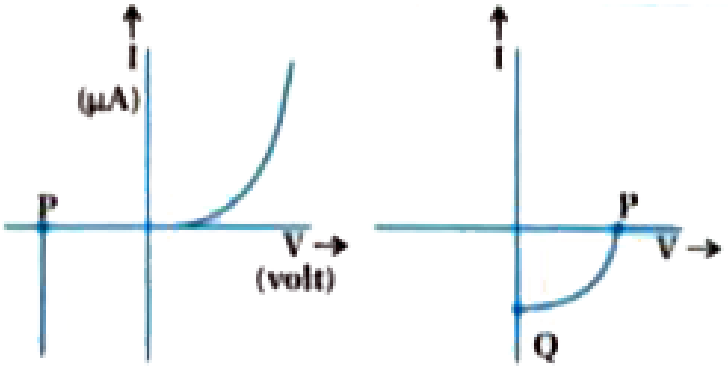
Section C Ncert Exemplar Solution Short Answer Type Questions



1. (1) (2)

(i) Name the type of a diode whose characteristics are shown in figure (1) and figure (2).

(ii) What does the point P in figure (1) represent?

(iii) What does the points P and Q in figure (2) represent?

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2. Three photodiodes D_1, D_2 and D_3 are made of semiconductors having band gaps of 2.5 eV, 2 eV and 3 eV,

respectively. Which ones will be able to detect light of wavelength 6000 Å?

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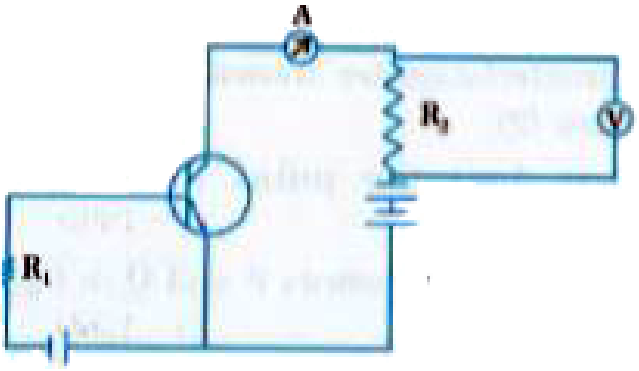
3. 

If the resistance R_1 is increased (See figure), how will the readings of the ammeter and voltmeter change?

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4. Two car garages have a common gate which needs to open automatically when a car enters either of the garages or cars

enter both. Devise a circuit that resembles this situation using diodes for this situation.

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5. How would you set up a circuit to obtain NOT gate using a transistor?

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6. Explain why elemental semiconductor cannot be used to make visible LEDs.

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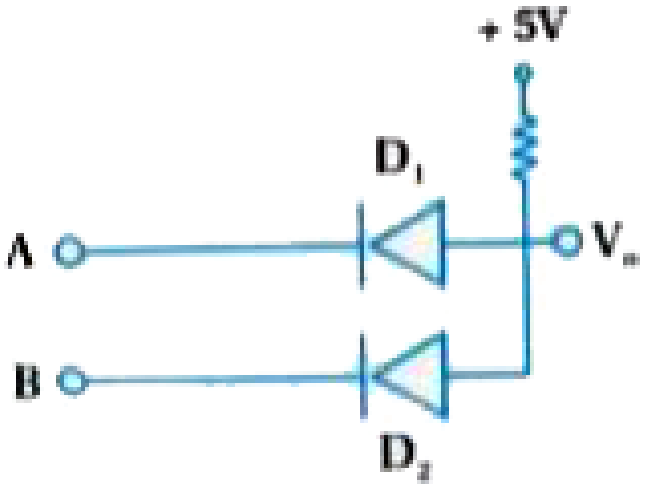

7.

Write the truth table for the circuit in figure. Name the gate that the circuit resembles.

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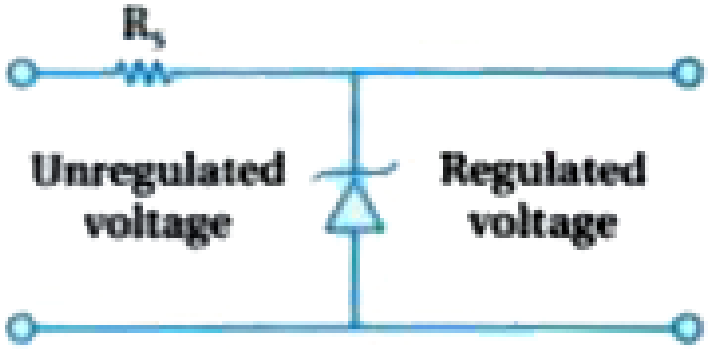

8.

A Zener of power rating 1 W is to be used as a voltage regulator. If

zener has a breakdown of 5V and it has to regulate voltage which fluctuated between 3V and 7V, what should be the value of R_s for safe operation (See figure)?

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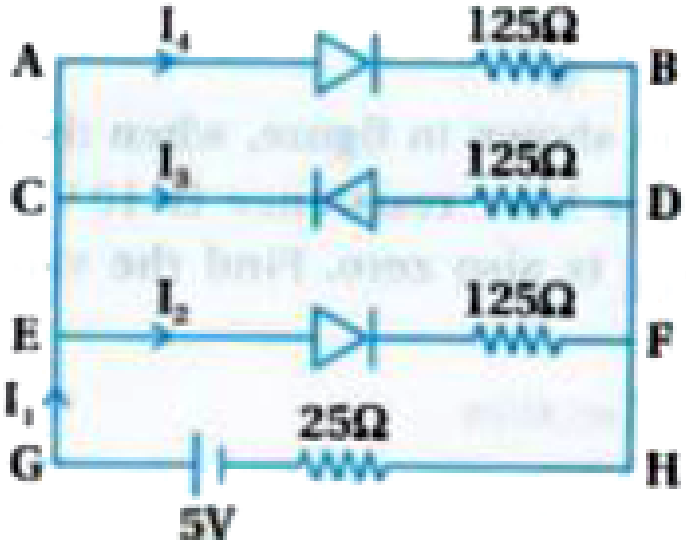
Section C Ncert Exemplar Solution Long Answer Type Questions

1.



If each diode in figure has a forward bias resistance of 25Ω and

infinite resistance in reverse bias, what will be the values of the current I_1, I_2, I_3 and I_4?

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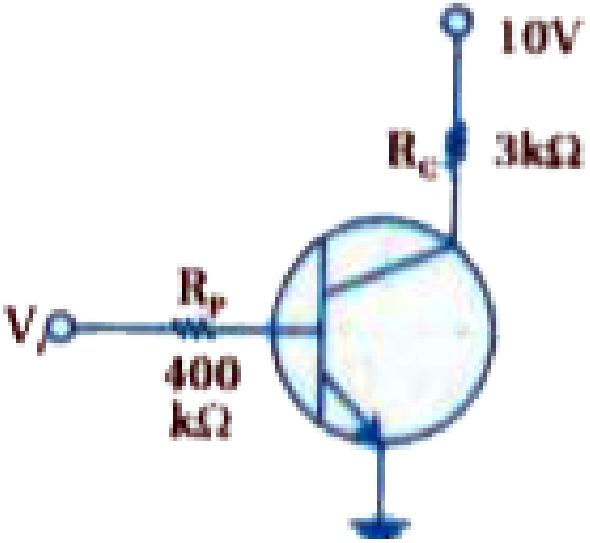

2.

In the circuit shown in figure, when the input voltage of the base resistance is 10V, V_{BE} is zero and V_{CE} is also zero. Find the values of I_B, I_C and β.

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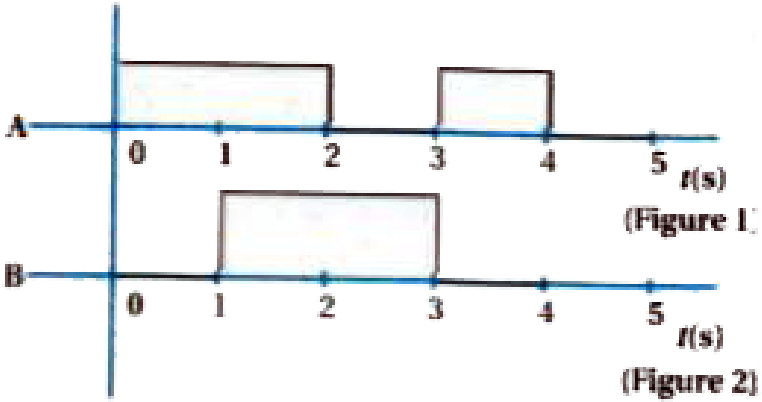
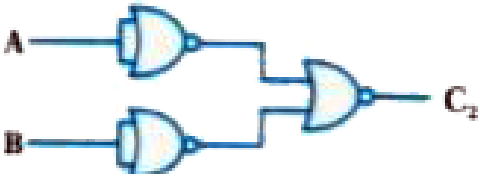


(Figure 1)

(Figure 2)

(Figure 3)



(Figure 4)

3.

Draw the output signals C_1 and C_2 in the given combination of gates as shown in figure.

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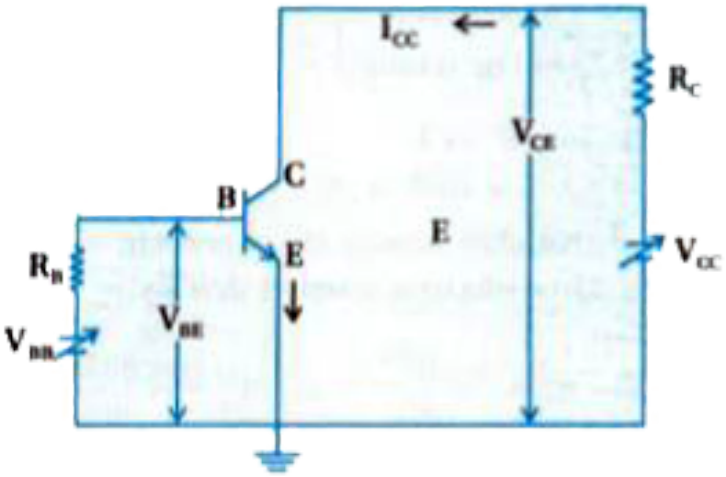
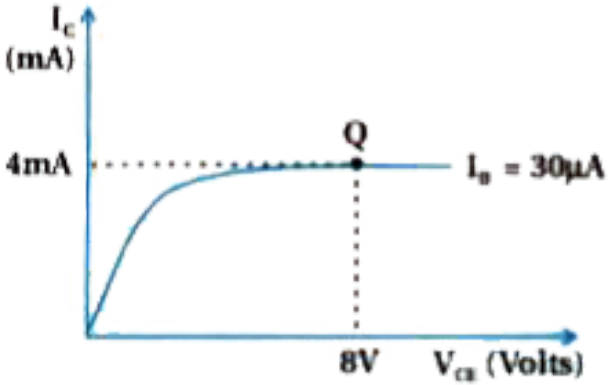


(Figure 1)



(Figure 2)

4.

Consider the circuit arrangement shown in figure (1) for studying input and output characteristics of n-p-n transistor in CE configuration.

Select the values of R_B and R_C for a transistor whose $V_{BE} = 0.7V$, so that the transistor is operating at point Q as

shown in the characteristics shown in figure (2). Given that the input impedance of the transistor is very small and $V_{CC} = V_{BB} = 16V$, also find the voltage gain and power gain of circuit making appropriate assumptions.

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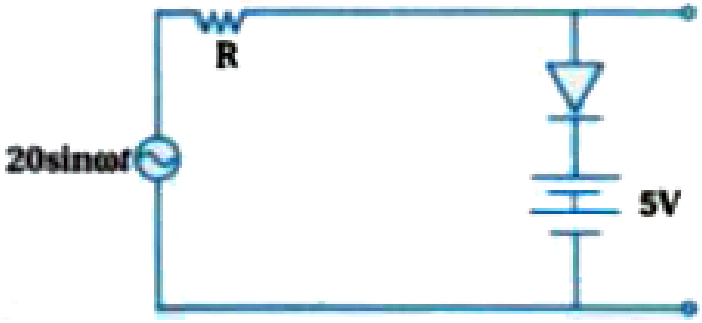
5.



Assuming the ideal diode, draw the output waveform for the circuit given in figure. Explain the waveform.

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6. Suppose a 'n'-type wafer is created by dopin Si crystal having 5×10^{28} atoms/m^3 with 1 ppm concentration of As. On the surface 200 ppm Boron is added to create 'P' region in this wafer. Considering $n_i = 1.5 \times 10^{16} m^{-3}$ (i) Calculate the denisties of the charge carrier in the n & p regions. (ii) Comment which charge carriers would contribute largely for the reverse saturation current when diode is reverse biased.

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7. An X-OR gate has following truth table:

A	B	Y
0	0	0
0	1	1
1	0	1
1	1	0

It is represented by following logic relation

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

Build this gate using AND, OR and NOT gates.

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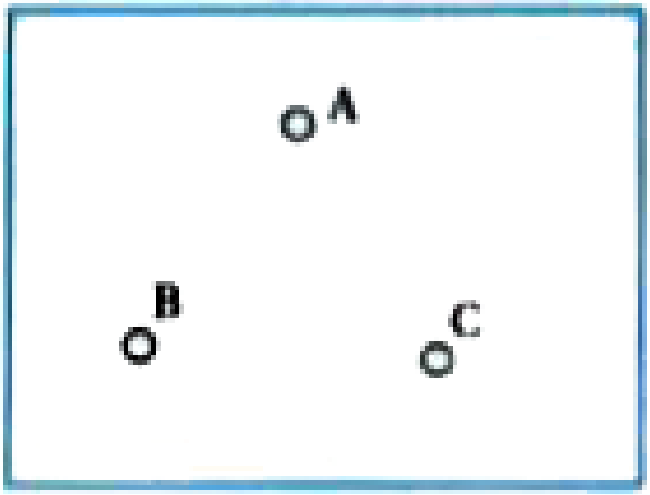
8. Consider a box with three terminals on top of it as shown in figure (a)



(Figure a)

Three components namely, two germanium diodes and one resistor are connected across these three terminals in some arrangement. A student performs an experiment in which any two of these three terminals are connected in the circuit shown in figure (b).

The student obtains graphs of current-voltage characteristics for unknown combination of components between the two terminals connected in the ciruit.

The graphs are :

(i) When A is positive and B is negative

(ii) When A is negative and B is positive

(iii) When B is negative and C is positive

(iv) When B is positive and C is negative

(v) When A is positive and C is negative

(vi) When A is negative and C is positive

From these graphs of current - voltage characteristic shown in figure (c) to (h), determine the arrangement of components between A, B and C.

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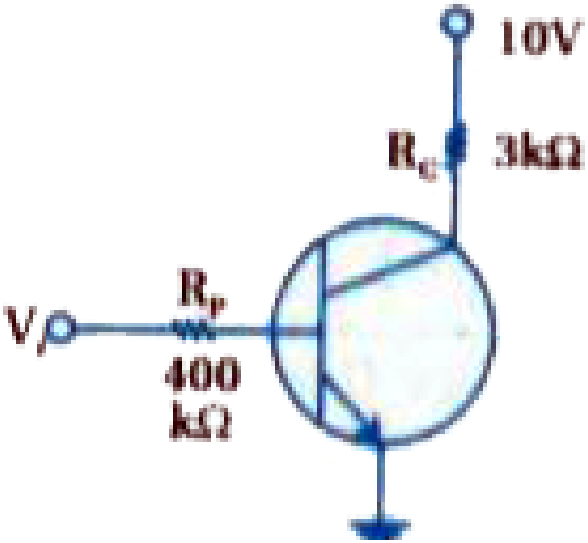

9.

In the circuit shown in figure, when the input voltage of the base resistance is 10V, V_{BE} is zero and V_{CE} is also zero. Find the values of I_B, I_C and β.

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10. 

The output of the given circuit in figure.

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Section D Multiple Choice Questions Mcqs Mcqs From Darpan Based On Textbook

1. Which of the following is not a conductor of electricity?

A. Plastic

B. Gold

C. Silicon

D. Platinum

Answer: A

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2. At what temperature semiconductor behaves as conductor?

A. $0^\circ C$

B. 0 K

C. $0^\circ F$

D. at room

Answer: B

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3. Resistivity of semiconductor of approximately ..... .

A. $\left(10^{-2} \text{ to } 10^{-8}\right)\Omega m$

B. $\left(10^{-5} \text{ to } 10^{-6}\right)\Omega m$

C. $\left(10^{11} \text{ to } 10^{19}\right)\Omega m$

D. $\left(10^{-5} \text{ to } 10^{+6}\right)\Omega m$

Answer: D

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4. The energy band diagram of a Si semiconductor crystal at absolute zero temperature,

A. has completely empty valence band and completely filled conduction band.

B. has completely empty conduction band and completely filled valence band.

C. has completely empty valence and conduction band and completely filled forbidden gap.

D. the conduction band is partially filled.

Answer: B

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5. The band gaps of a conductor, semiconductor and insulator are respectively $Eg_1,$ and Eg_2 and Eg_3. The relationship between them can be given as .....

A. $Eg_1 = Eg_2 = Eg_3$

B. $Eg_1 > Eg_2 > Eg_3$

C. $Eg_1 < Eg_2 < Eg_3$

D. $Eg_1 < Eg_2 > Eg_3$

Answer: C

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6. When will the conductivity of a Ge semiconductor decrease?

A. On adding donor impurity

B. On adding acceptor impurity

C. On making UV light incident

D. On decreasing the temperature

Answer: D

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7. On increasing the temperature, width forbidden gap ....

A. becomes zero

B. decreases

C. increases

D. not changing

Answer: B

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8. A piece of copper and piece of germanium and cooled upto 80 K temperature so .....

A. resistance of both increases

B. resistance of both increases

C. resistance of copper piece increases and piece of germanium decreases.

D. resistance of copper piece decreases and piece of germanium increases.

Answer: D

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9. Resistivity of metal ..... and resistivity on semiconductor ..... on temperature decreases

A. increases, decreases

B. decreases, increases

C. increases, increases

D. decreases, decreases

Answer: D

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10. Give electronic configuration of silicon.

A. $1s^1 \quad 1s^2 \quad 2s^2 \quad 3s^2 \quad 3p^2 \quad 3p^6$

B. $1s^2 \quad 2s^2 \quad 2p^6 \quad 3s^2 \quad 3p^2$

C. $1s^2 \quad 1s^2 \quad 3s^2 \quad 2p^4 \quad 3s^2 \quad 3p^2$

D. $1s^2 \quad 2s^2 \quad 2p^6 \quad 3s^1 \quad 3p^3$

Answer: B

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11. Give electronic configuration of germanium.

A. $1s^2, 2s^2 2p^6, 3s^2 3d^{10}, 4s^2 4p^6$

B. $1s^2, 2s^2 2p^6, 3s^2 3d^{10}, 4s^1 4p^1$

C. $1s^2, 2s^2 2p^6, 3s^2 3d^{10}, 4s^2 4p^2$

D. $1s^2, 2s^2 2p^6 2d^{10}, 3p^6, 4s^2 4p^2$

Answer: C

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12. When the semiconductor is heated .....

A. the number of electrons increases, while the number of holes decreases.

B. the number of holes increases, while the number of electron decreases.

C. the number of electrons and holes remains the same.

D. the number and electrons and holes increases equally.

Answer: D

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13. Electric field is applied to a semiconductor. In it density of conducting charge is n the drift velocity is v. Now increasing the temperature of semiconductor .....

A. v and n increases

B. v and n decreases

C. v increases and n remaining constant

D. v decreases and n increases

Answer: D

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14. The density of electron and holes in an intrinsic semiconductor is n_e and n_h respectively. Which of the following options are true?

A. $n_h > n_e$

B. $n_e > n_h$

C. $n_e = n_h$

D. $n_h > > n_e$

Answer: C

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15. ..... is the charge on hole.

A. $-e$

B. $+e$

C. $-e$ and $+e$

D. $+e$ or $+e$

Answer: B

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16. Holes and electrons are .....

A. in the same direction

B. in opposite direction

C. mutually perpendicular

D. towards positive ions

Answer: B

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17. To prepare the n-type semiconductor from a tetravalent Si or Ge, the impurity atoms of valency ..... are chosen.

A. 1

B. 2

C. 5

D. 6

Answer: C

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18. In intrinsic semiconductor the drift velocity of holes and electron are respectivelty v_h and v_e then, ...

A. $v_e < v_h$

B. $v_e = v_h$

C. $v_e > v_h$

D. None of these

Answer: C

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19. In a semiconducting material the mobilities of electrons and holes are μ_e and μ_h respectively. Which of the following is true?

A. $\mu_e > \mu_h$

B. $\mu_e < \mu_h$

C. $\mu_e = \mu_h$

D. $\mu_e < 0, \mu_h > 0$

Answer: A

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20. To make a p-type semiconductor out of pure silicon, it has to mix atoms of ..... impurity.

A. phosphorus

B. boron

C. antimony

D. copper

Answer: B

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21. p-type semiconductor is formed when .....

(A) As impurity is mixed in Si.

(B) Al impurity is mixed in Si.

(C) B impurity is mixed in Ge.

(D) P impurity is mixed in Ge.

A. A and C

B. A and D

C. B and C

D. B and D

Answer: C

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22. Is there any benefit to adding trivalent or pentavalent impurity to the copper ?

A. Yes

B. No

C. Yes and No

D. Nothing can be said

Answer: B

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23. Trivalent and pentavalent impurities are ....., respectively in terms of electric.

A. negative and positive

B. positive and negative

C. neutral and neutral

D. positive and positive

Answer: C

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24. The ratio of number density of free electron and hole in p-type semiconductor is .....

A. almost same

B. less than one

C. more than one

D. zero

Answer: B

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25. The number density of electron is $4.5 \times 10^{22} m^{-3}$ and number density of holes is $4.5 \times 10^{9} m^{-3}$. This semiconductor is .....

A. p-type

B. n-type

C. intrinsic type

D. p and n both type

Answer: B

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26. The number density of electron is $7 \times 10^{12} m^{-3}$ and number density of hole is $7 \times 10^{12} m^{-3}$. This semiconductor will be ..... Type.

A. p

B. n

C. intrinsic

D. p and n both type

Answer: C

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27. Which of the diagram shown in figure represents variation of total mechanical energy of a pendulum oscillating in air as function of time?

A. n-type semiconductor - room temperature

B. n-type semiconductor - 0 K temperature

C. n-type semiconductor - $0^{\circ} C$ temperature

D. intrinsic semiconductor

Answer: A

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28. What is the unit of energy?

A. n-type semiconductor

B. p-type semiconductor

C. Intrinsic semiconductor

D. Both n and p type semiconductor

Answer: B

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29. n-type semiconductor .....

A. energy levels of impurity atoms E_D are nearer to valence energy level E_V.

B. energy levels of E_D are nearer to conduction energy levels E_C.

C. energy levels E_D are in middle of energy levels E_C and E_V.

D. energy level E_D are on the top of energy levels.

Answer: B

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30. In one atom of As is added per 10^3 atoms of Ge then the number of free electron in one mole of Ge will be .....

A. 10^{17}

B. 10^{20}

C. 10^{10}

D. 10^{13}

Answer: C

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31. If one Al atom added to 10^9 per atom of Si then charge on holes in one mole will be .....

A. $1.6 \times 10^{-10} C$

B. $1.6 \times 10^{-5} C$

C. $1.6 \times 10^{-8} C$

D. $0.6 \times 10^{-19} C$

Answer: B

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32. In pure crystal of silicon at 300 K temperature having number of atom $n_i = 10^{16} m^{-3}$. If 10^{21} atoms of phosphorus added per m^3 then number of holes created will be ..... $/m^3$.

A. 10^{21}

B. 10^{19}

C. 10^{11}

D. 10^5

Answer: C

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33. Therefore are 6×10^{19} electrons per unit cubic metre of pure semiconductor. What will be the number of holes for this semiconductor of dimension $1cm \times 1cm \times 2cm$?

A. 6×10^{19}

B. 1.2×10^{14}

C. 12×10^{14}

D. 2×10^{6}

Answer: B

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34. The number density of electron is a semiconductor is $8 \times 10^{13} cm^{-3}$ and number density of hole is $5 \times 10^{12} cm^{-3}$ then,

(1) Which type of this semiconductor is?

(2) How much is resistivity of it? (Mobility of electron is 23000 $cm^2 V^{-1} s^{-1}$ and mobility of hole is 100 $cm^2 V^{-1} s^{-1}$ and $e = 1.6 \times 10^{-19} C$)

A. $p - 29.45 \times 10^{-2} \Omega m$

B. $n - 3.396 \times 10^{-2} \Omega m$

C. $p - 3.396 \times 10^{-2} \Omega m$

D. $n - 2.945 \times 10^{-2} \Omega m$

Answer: B

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35. What amount of inpurity of atomic density in added toform N-type semiconductor in Ge semiconductor of conductivity σ is $5\Omega^{-1}cm^{-1}$ Mobility of electron in N-type semiconductor is 3900 $cm^2V^{-1}s^{-1}$. Ignore conductivity due to hole. $\left(e = 1.6 \times 10^{-19}C\right)$

A. $2.25 \times 10^{21}m^{-3}$

B. $4.007 \times 10^{21}m^{-3}$

C. $8013 \times 10^{21}m^{-3}$

D. $8.013 \times 10^{21}m^{-3}$

Answer: D

Watch Video Solution

36. Potential near the junction in p-n junction is zero then potential at ..... is .....

A. n-side, negative

B. p-side, negative

C. n-side, negative

D. p-side, positive

Answer: B

Watch Video Solution

37. In p-n junction, depletion barrier near the junction is due to .....

A. difference in crystal structure.

B. difference of resistance.

C. difference of temperature.

D. potential difference near the junction.

Answer: D

Watch Video Solution

38. If proportion of impurity is less in p-n junction .....

A. the width of depletion region is more.

B. the width of depletion region is less.

C. electric field is strong near junction.

D. electric field remains same near junction.

Answer: A

Watch Video Solution

39. If the proportion of impurity increases in semiconductor in p-n junction then depletion region .....

A. width increase

B. width decreases

C. electric field becomes weak

D. electric field becomes same

Answer: B

Watch Video Solution

40. Breakdown voltage means .....

A. voltage at which current become zero in reverse bias.

B. voltage at which current increases suddenly in reverse bias.

C. voltage at which current becomes zero in forward bias.

D. voltage at which current increases suddenly in forward bias.

Answer: B

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41. Increasing forward voltage in diode, the width of depletion layer is .....

A. decreases

B. increases

C. does not change

D. increases in proportion to the applied voltage

Answer: A

Watch Video Solution

42. The ratio of resistance of forward bias and reverse bias in p-n connection is .....

A. $10^2 : 1$

B. $10^{-2} : 1$

C. $1 : 10^{-4}$

D. $1 : 10^4$

Answer: D

Watch Video Solution

43. p-side of semiconductor is earthing and -2V potential applied at n-side so in diode .....

A. current is flowing.

B. it is breakdown.

C. current is not flowing.

D. partial current is flowing.

Answer: A

Watch Video Solution

44. What is responsible for depletion barrier in depletion layer?

A. Ions

B. Electrons

C. Holes

D. Forbidden gap

Answer: A

Watch Video Solution

45. What is the width n cm of depletion layer in p-n junction?

A. 10^{-2}

B. 10^{-3}

C. 10^{-6}

D. 10^{-8}

Answer: C

Watch Video Solution

46. Increasing reverse bias voltage applied to p-n junction diode .....

A. depletion capacitance and resistance of diode of diode increases.

B. depletion capacitance and resistance of diode of diode decreases.

C. depletion capacitance decreases but resistance of diode increases.

D. depletion capacitance increases but resistance of diode decreases.

Answer: C

 Watch Video Solution

47. Keeping forward bias voltage from 0.6 V to 0.7 V in a p-n junction diode its current become 1 mA to 3mA. The dynamic resistance of diode is .....

A. 50Ω

B. 500Ω

C. 600Ω

D. 233Ω

Answer: A

Watch Video Solution

48. In an ammeter 0.2% of main current passes through the galvonometer. If resistance of galvonometer is G, the resistance of ammeter will be _____

A. 4.7 mA

B. 4.3 mA

C. 5 mA

D. 0 mA

Answer: C

Watch Video Solution

49. In an ammeter 0.2% of main current passes through the galvonometer. If resistance of galvonometer is G, the resistance of ammeter will be _____

A. 4.7 mA

B. 4.3 mA

C. 5 mA

D. 0 mA

Answer: D

Watch Video Solution

50. When p-n junction diode is forward biased .....

A. $\frac{1}{15}A$

B. $\frac{1}{7}A$

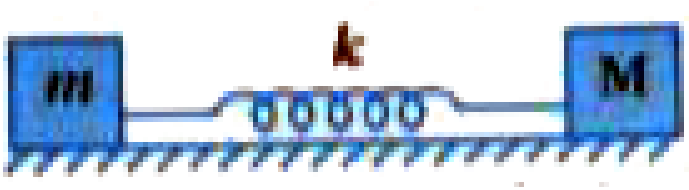
C. $\frac{1}{25}A$

D. $\frac{1}{480}A$

Answer: B

Watch Video Solution

51. A spring of force constant k is kept in the compressesd condition between two blocks masses m and M on the smooth surface of a table as shown in figure .When the spring is released , both the blocks move in opposite directions .When the spring attains the orginal (normal) position . both blocks lose the constacts with the spring . If x is the intial compression of the spring find the speeds of block while getting detached from the spring .



A. 3.33 mA

B. zero

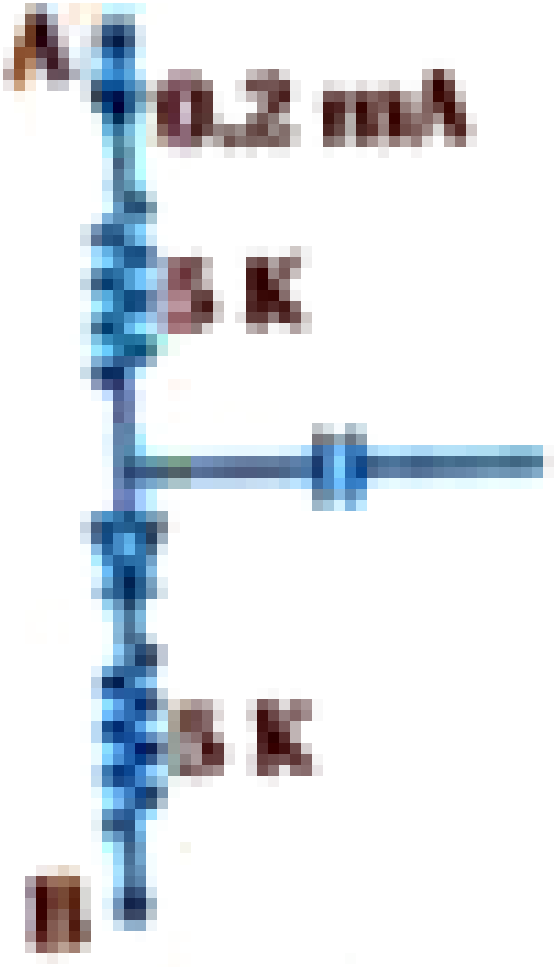
C. 0.15 mA

D. 0.3 mA

Answer: B

Watch Video Solution

52.



In the circuit shown in figure, if the diode forward voltage drop is

0.3 V, the voltage difference between A and B is

A. zero

B. 0.3 V

C. 0.6 V

D. 0.12 V

Answer: C

Watch Video Solution

53. In a zener diode, the reverse bias voltage is 3V and width of the depletion region is 300 Å, the electric field intensity will be ....., $\frac{V}{cm}$.

A. zero

B. 0.1 V

C. 0.3 V

D. 0.6 V

Answer: D

Watch Video Solution

54. What is order of current flowing during lightening in the sky ?

A. $\frac{0.5}{0.7}A$

B. $\frac{0.7}{0.5}A$

C. zero

D. 0.12A

Answer: C

Watch Video Solution

55. The current is flowing through solenoid, then solenoid acting as what ?

A. 0.1 mA

B. 10 mA

C. 0.1 A

D. none of these

Answer: B

Watch Video Solution

56. The potential barrier of 0.5 V exist across a p-n junction. If the dpletion region is $5.0 \times 10^{-7} m$ wide, then the intensity of electric field in this region is .....

A. $1.0 \times 10^{9} V / m$

B. $1.0 \times 10^6 V/m$

C. $2.0 \times 0^5 V/m$

D. $2.0 \times 10^6 V/m$

Answer: B

Watch Video Solution

57. Which of the following is true ?

A. 

B. 

C. 

D. 

Answer: B

Watch Video Solution

58. Which of the following does not result in an increase in the entropy?

A. p-n junction diode D_1

B. p-n junction diode D_2

C. p-n junction diode D_3

D. p-n junction diode D_4

Answer: C

Watch Video Solution

59. 3 identical capacitors are joined in parallel and are charged with a battery of 10 V. Now the battery is removed and they are joined in series with each other in this condition what would be

the potential difference between the freed plates in the combination?

A. For circuit (1) and (2)

B. For circuit (2) and (3)

C. For circuit (3) and (1)

D. None of the above circuits

Answer: A

Watch Video Solution

60. When p.d between two ends of secondary of full wave rectification is 100 V then in p-n junction p.d. is ..... between p and n in reverse bias.

A. zero

B. 50 V

C. 100 V

D. none of these

Answer: B

Watch Video Solution

61. We get ..... Current through rectifier without simple filter.

A. changing direct

B. constant direct

C. alternating current

D. A.C.

Answer: A

Watch Video Solution

62. An A.C. supply of 350 V, 60 Hz is applied to a full wave rectifier. If internal resistance of each diode is 200Ω and load resistance $R_1 = 5k\Omega$, then the maximum value of output current is .....

A. 0.065 A

B. 0.092 A

C. 0.095 A

D. 0.07 A

Answer: B

Watch Video Solution

63. Consider a current carrying wire (current I) in the shape of a circle. Note that as the current progresses along the wire, the

direction of J (current density) changes in an exact manner, while the current I remain unaffected. The agent that is essentially responsible for is

A. 0.13 A

B. 0.029 A

C. 0.058 A

D. 0.059 A

Answer: C

Watch Video Solution

64. Which of the following is true ?

A. 

B. 

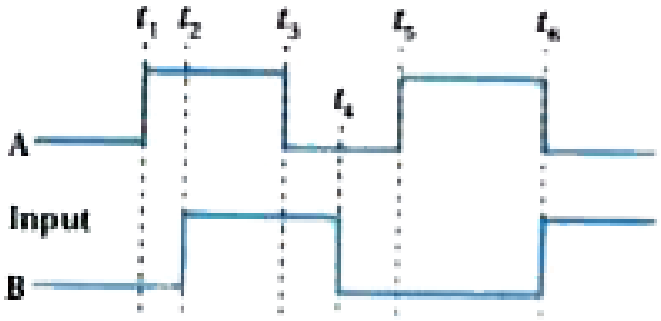
C.

D.

Answer: D

Watch Video Solution

65. Justify the output waveform (Y) of the OR gate for the following inputs A and B given in figure.



A. the input will be the same

B. the halfwave rectifier will get

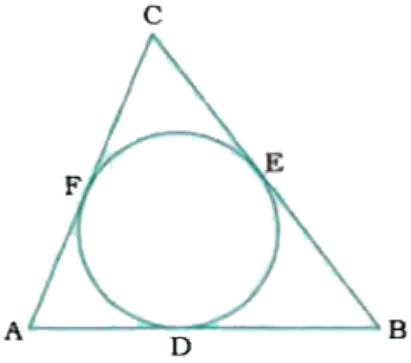
C. the fullwave rectifier will get

D. zero will get

Answer: C

Watch Video Solution

66. In the given figure, if $AB = 12cm.\ BC = 8cm$ and $AC = 10cm,$ then $AD = \ldots\ldots\ldots cm$



A. the input will look the same.

B. the halfwave rectifier will get.

C. the fullwave rectifier will get.

D. zero will get.

Answer: C

Watch Video Solution

67. To easily obtain the zener effect .....

A. thickness of depletion layer should be increased by increasing the amount of impurity.

B. thickness of depletion layer should be decreased by increasing the amount of impurity.

C. diode should be made as small as possible.

D. none of the above one.

Answer: B

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68. The network shown in figure is a part of the circuit. (The battery has negligible resistance)

At a certain instant the current I = 5A and is decreasing at a rate of $10^3 As^{-1}$. What is the potential difference between point B and A ?

A. 500 V

B. 10 V

C. 0 V

D. none of these

Answer: D

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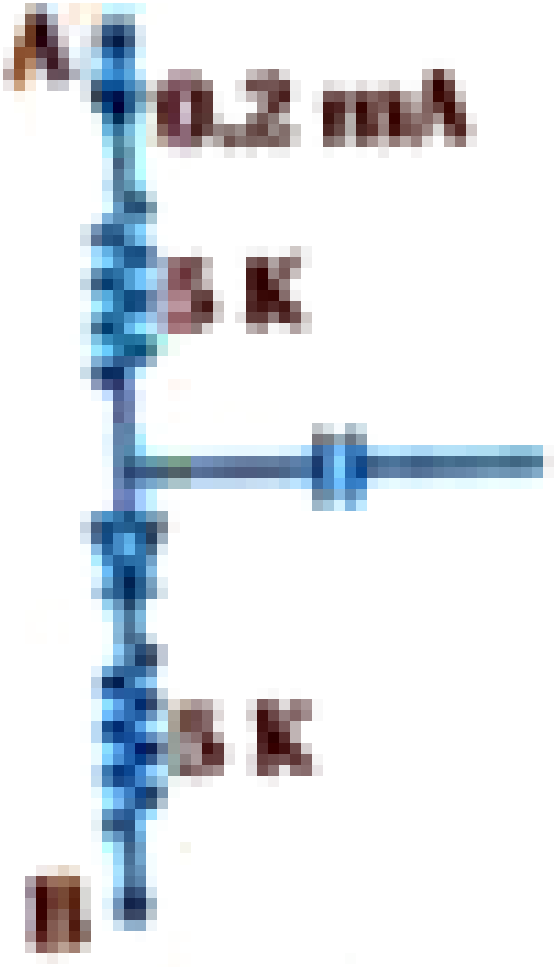
69.



In the circuit shown in figure, if the diode forward voltage drop is

0.3 V, the voltage difference between A and B is

A. 2.3 mA, 11.7 V

B. 2.34 A, 11.7 V

C. 2.43 mA, 1.17 V

D. 2.4 A, 12.3 V

Answer: A

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70. The breakdown voltage of a zener diode is V_Z. It is connected to the supply of V volts, so which of the following options for diode will act as regulated voltage?

A. $V < V_Z$

B. $V = V_Z$

C. $V > V_Z$

D. $V = \sqrt{V_Z}$

Answer: C

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71. Which diode converts light waves into electrical signals in the absence of external battery?

A. LED

B. Solar cell

C. Photodiode

D. Zener diode

Answer: B

Watch Video Solution

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72. The band gap of the semiconductor of the LED that produces the visual light is at least .....

A. 0.3 eV

B. 0.7 eV

C. 1 eV

D. 1.8 eV

Answer: D

Watch Video Solution

73. ..... do not always have to be Sunshine.

A. p-n junction diode

B. Solar cell

C. Photodiode

D. LED

Answer: B

Watch Video Solution

74. Finger shape anode is used in .....

A. LED

B. photodiode

C. solar cell

D. zener diode

Answer: C

Watch Video Solution

75. At breakdown voltage the reverse current of p-n junction can be ranked mA ..... .

A. by increasing breakdown voltage

B. by decreasing breakdown voltage

C. by increasing the amount of impurities

D. by decreasing the amount of impurities

Answer: C

Watch Video Solution

76. If the incident wavelength on a photodiode is 1700 nm, what is its energy gap $\left(E_g\right)$?

A. 0.073 eV

B. 1.20 eV

C. 0.73 eV

D. 1.16 eV

Answer: C

Watch Video Solution

77. Giving 2V to LED passes a 10 mA current. If you want to connect this diode to a 6V battery, then the value of resistance in series kept.....

A. 400Ω

B. 4000Ω

C. 40Ω

D. 300Ω

Answer: A

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78. If the maximum load voltage of 40 V is to be obtained from the bridge rectifier, the value of rms from the secondary is approximately .....

A. 0 V

B. 14.4 V

C. 28.3 V

D. 56.6 V

Answer: C

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79. When we use zener diode as a voltage regulator, its connection .....

(i) forward bias

(ii) reverse bias

(iii) should parallel with load

(iv) should series with load

A. (i) and (ii) are true

B. (ii) and (iii) are true

C. only (i) is true

D. only (iv) is true

Answer: B

Watch Video Solution

80. The heat produced per unit time, on passing electric current through a conductor at a given temperature is directly proportional to the .....

A. 10 mA

B. 6.67 mA

C. 5 mA

D. 3.33 mA

Answer: D

Watch Video Solution

81. To get light in visible region through LED ..... Semiconductor is used.

A. silicon

B. germanium

C. gallium

D. tellurium

Answer: C

Watch Video Solution

82. Forward bias has to be provided for the ..... Semiconductor device to work.

A. photodiode

B. zener diode

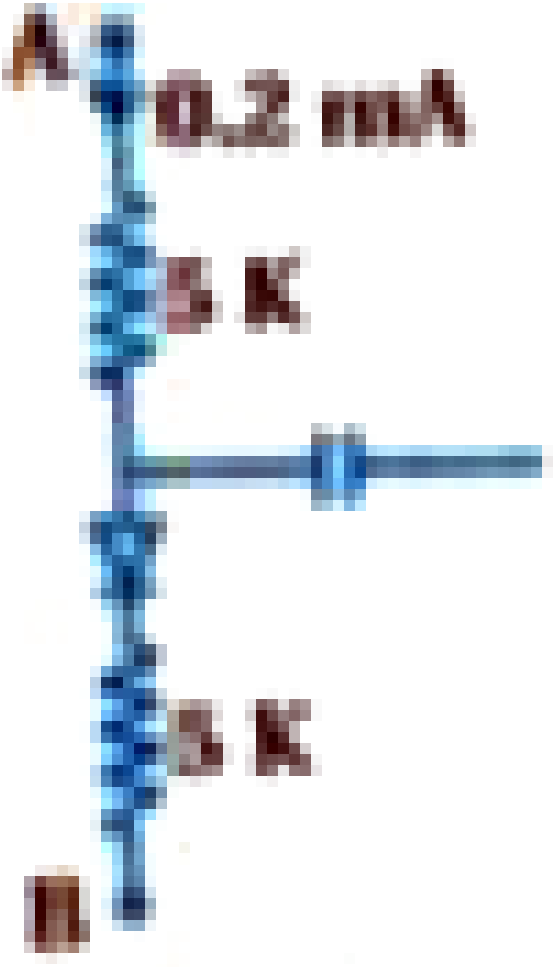
C. varactor diode

D. light emitting diode (LED)

Answer: D

Watch Video Solution

83.



In the circuit shown in figure, if the diode forward voltage drop is

0.3 V, the voltage difference between A and B is

A. 7V

B. 8V

C. 10V

D. 15V

Answer: A

Watch Video Solution

84. What is the difference between cutaneous and pulmonary respiration ?

A. 6 V

B. 11 V

C. 9 V

D. 17 V

Answer: B

Watch Video Solution

85. The circuit symbol of LED, p-n junction diode is .....

A. 

B. 

C. 

D. 

Answer: A

Watch Video Solution

86. Which of the following is true ?

A. 

B. 

C. 

D. 

Answer: B

Watch Video Solution

87. Which of the following in true for Golden rice ?

A. A, B and C are analog signals.

B. A and B are analog signals, but C is digital signal.

C. A and C are digital signals, but B is analog signal

D. A and C are analog signals, but B is digital signal.

Answer: D

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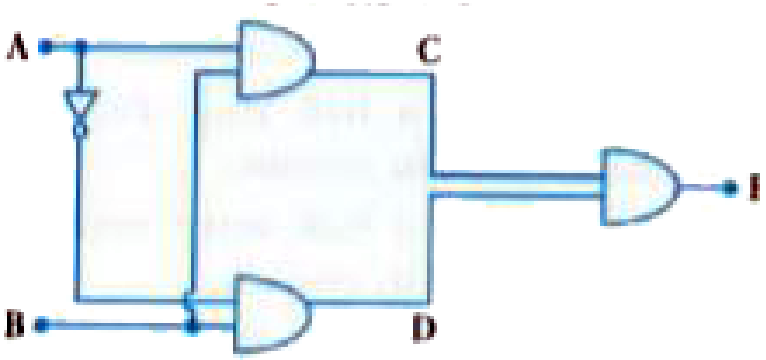
88.



Truth table for the given circuit (See figure) is

A. OR gate

B. AND gate

C. NOT gate

D. none of these

Answer: C

Watch Video Solution

89. Which of the following in true for Golden rice ?

Watch Video Solution

90. Which gate does not require a p-n junction diode?

A. NOT

B. AND

C. OR

D. None of these

Answer: A

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91. NAND gate is combination of ..... gate and ..... gate.

A. OR, NOT

B. OR, AND

C. AND, NOT

D. AND, NOR

Answer: C

Watch Video Solution

92. NOR gate is the combination of ..... Gate and ..... gate.

A. OR, AND

B. NOT, OR

C. NAND, OR

D. none of these

Answer: B

Watch Video Solution

93. ..... NAND gate is required for OR gate.

A. 1

B. 2

C. 3

D. 0

Answer: C

Watch Video Solution

94. .....NOT gate is required for NAND gate.

A. 0

B. 1

C. 2

D. 3

Answer: B

Watch Video Solution

95. Which of the following logic gate is an universal gate?

A. AND gate

B. OR gate

C. NAND gate

D. NOR gate

Answer: D

Watch Video Solution

96. Which of the following logic gate is an universal gate?

A. AND gate

B. NAND gate

C. NOR gate

D. NOT gate

Answer: D

Watch Video Solution

97. Which of the following is true ?

A. 

B. 

C. 

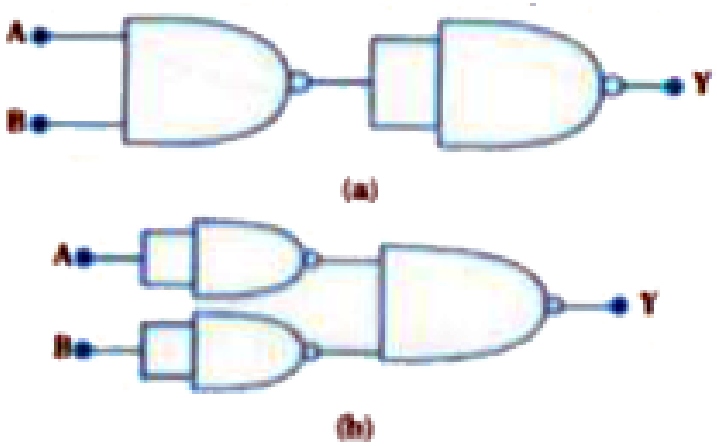
D. 

Answer: C

Watch Video Solution

98. You are given the circuits as shown in figure, which consist of NAND gates. Identify the logic operation carried out by the two

circuits.



A. OR gate and an AND gate respectively.

B. AND gate and NOT gate respectively.

C. AND gate and an OR gate respectively.

D. OR gate and NOT gate respectively.

Answer: A

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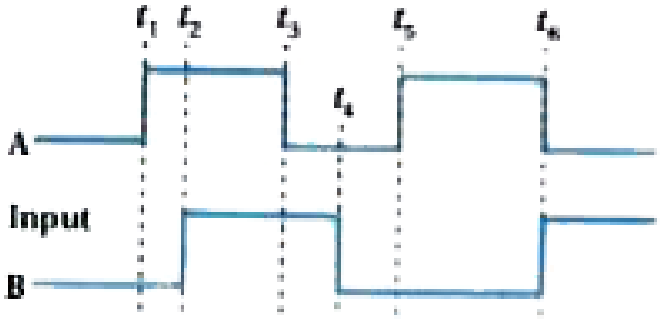
99. Justify the output waveform (Y) of the OR gate for the following inputs A and B given in figure.



A. 0, 0

B. 0, 1

C. 1, 0

D. 1, 1

Answer: D

Watch Video Solution

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

Hence identify the exact logic operation carried out by this circuit.

A. NOT

B. AND

C. OR

D. NAND

Answer: C

Watch Video Solution

101. 

The output of the given circuit in figure.

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

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

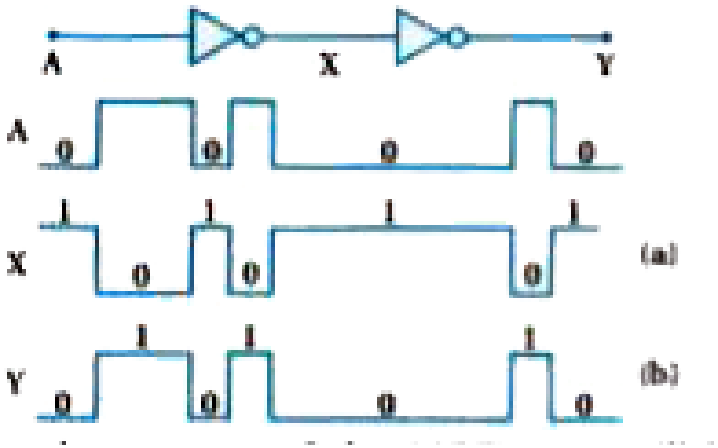
C. $Y = \overline{A} + B$

D. $Y = A + B$

Answer: C

Watch Video Solution

102. A logic circuit is shown in the diagram. Draw the output signal at the point X and Y for the input signal shown in the figure at point A.



A. NAND

B. AND

C. OR

D. NOR

Answer: A

Watch Video Solution

103. What will be the value of input A and B for the boolean equation $\left(\overline{A+B}\right) \cdot \left(\overline{A \cdot B}\right) = 1$?

A. 0, 0

B. 0, 1

C. 1, 0

D. 1, 1

Answer: A

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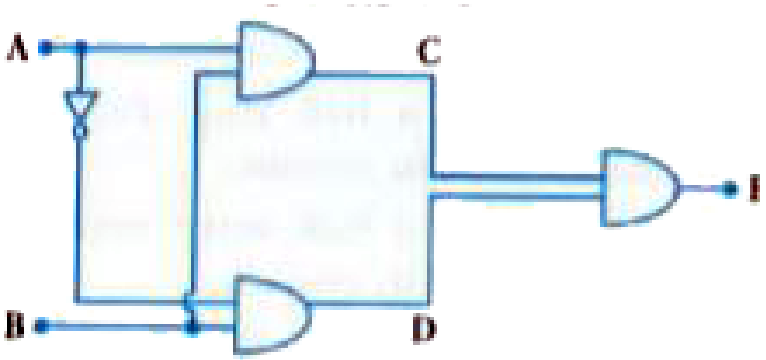
104.



Truth table for the given circuit (See figure) is

A. $Y = \overline{A} \cdot B + C$

B. $Y = \overline{A} \cdot \left(\overline{B} + \overline{C}\right)$

C. $y = \overline{A} \cdot \left(B + \overline{C}\right)$

D. $Y = \overline{A} \cdot (B + C)$

Answer: D

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105. How many AND gates are needed for NAND gate?

A. 4

B. 3

C. 2

D. 1

Answer: D

Watch Video Solution

106. To form one AND gate require ..... NOR gates.

A. 1

B. 2

C. 3

D. 4

Answer: C

Watch Video Solution

107. Write the truth table of NAND gate.

A. (iv)

B. (iii)

C. (ii)

D. (i)

Answer: D

Watch Video Solution

108. If E and p are the energy and momentum of a photon respectively then on decreasing in the wavelength of photon.

A. 1,1,1,0

B. 0,1,0,1

C. 0,1,0,0

D. 1,0,1,1

Answer: A

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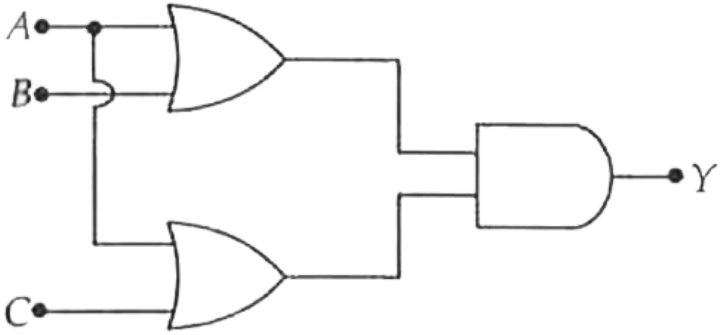
109. Output to a given logic circuit .....



A. $A \cdot (B + C)$

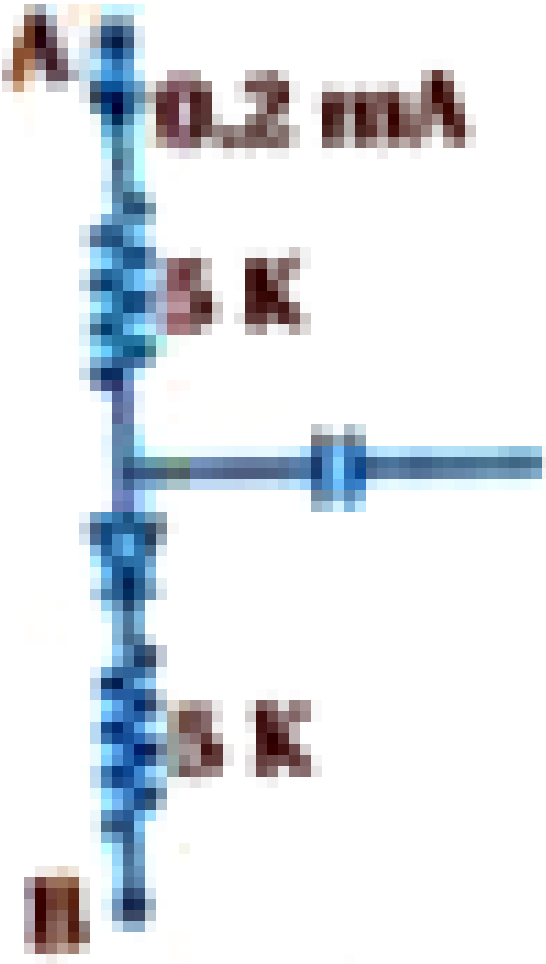
B. $A \cdot (B \cdot C)$

C. $(A + B) \cdot (A + C)$

D. $A + B + C$

Answer: C

Watch Video Solution



110.

In the circuit shown in figure, if the diode forward voltage drop is 0.3 V, the voltage difference between A and B is

A. NOR gate

B. OR gate

C. AND gate

D. NAND gate

Answer: D

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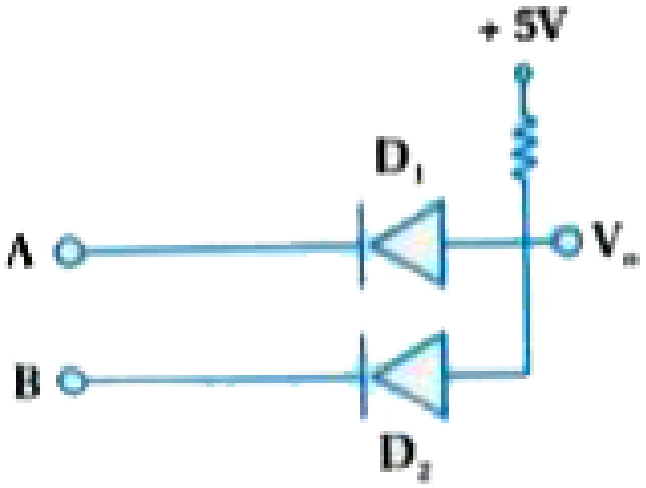

111.

Write the truth table for the circuit in figure. Name the gate that the circuit resembles.

A. ABCD

B. $AD + BC$

C. $A + B + C + D$

D. $AB + CD$

Answer: C

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112. In a Zener regulated power supply a Zener diode with $V_Z = 6.0V$ is used for regulation. The load current is to be 4.0 mA and the unregulated input is 10.0V. What should be the value of series resistor R_S?

A. 416.7Ω

B. 250Ω

C. $6 \times 10^{-3}\Omega$

D. 167Ω

Answer: D

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113. In half wave rectification, what is the output frequency if the input frequency is 50 Hz.

A. 25 Hz

B. 50 Hz

C. 100 Hz

D. zero

Answer: B

Watch Video Solution

114. If the input frequency is 50 Hz in fullwave rectification, what is the output frequency?

A. 50 Hz

B. 100 Hz

C. 25 Hz

D. 200 Hz

Answer: B

Watch Video Solution

115. Write the truth table of NAND gate.

A. The output is '1' when one or all the input are '1'.

B. The output is '1' only when all input is '1' for all other conditions it is '0'.

C. When input is '1' output is '0' and input is '0' when output is '1'.

D. When one input is '0', output is '1' and all input is '1' then output is '0'.

Answer: C

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116. A triangular park ABC has sides 120 m, 80 m and 50 m (see the given figure). A gardener Dhania has to put a fence all around it and also plant grass inside. How much area does she need to plant ? Find the cost of fencing it with barbed wire at the rate of

Rs. 20 per metre leaving a space 3 m wide for a gate on one side.

A. OR

B. AND

C. NOT

D. NAND

Answer: C

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Section D Multiple Choice Questions Mcqs Mcqs Asked In Competitive Exams

1. At absolute zero temperature Si acts as .....

A. non metal

B. metal

C. insulator

D. none of these

Answer: C

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2. The energy band gap is maximum in .....

A. metals

B. insulator

C. super conductor

D. semiconductor

Answer: B

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3. Formation of covalent bonds in compounds exhibits .....nature.

A. wave

B. particle

C. both wave and particle

D. none of these

Answer: A

Watch Video Solution

4. By increasing the temperature, the specific resistance of a conductor and a semiconductor.

A. increases for both

B. decreases for both

C. increases, decreases

D. decreases, increases

Answer: C

Watch Video Solution

5. The difference in the variation of resistance with temperature in a metal and a semiconductor arises essentially due to the difference in the .....

A. crystal structure.

B. variation of the number of charge carriers with temperature.

C. type of bonding.

D. variation of scattering mechanism with temperature.

Answer: B

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6. In the middle of the electron layer of a reverse biased p-n junction, the .....

A. electric field is zero.

B. electric field is maximum.

C. potential is zero

D. potential is maximum.

Answer: B

Watch Video Solution

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

A. the resistance of each increases.

B. the resistance of each decreases.

C. the resistance of copper increases, while germanium decreases.

D. the resistance of germanium increases, while copper decreases.

Answer: D

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8. The manifestion of band structure in solids is due to .....

A. Heisenberg's uncertainty principle.

B. Pauli's exclusion principle.

C. Bohr's correspondence principle.

D. Boltzmann's law.

Answer: B

Watch Video Solution

9. When p-n junction diode is forward biased .....

A. the depletion region is reduced and barrier height is increased.

B. the deplection region is widened and barrier height is reduced.

C. both the depletion region and barrier height reduced.

D. both the depletion region and barrier height increased.

Answer: C

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10. The electrical conductivity of a semiconductor of a semiconductor increases when electromagnetic radiation of wavelength shorter than 2480 nm, is incident on it. The band gap in (eV) for the semi conductor is .....

A. 0.5 eV

B. 0.7 eV

C. 1.1 eV

D. 2.5 eV

Answer: A

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11. In a full wave rectifier circuit operating from 50 Hz mains frequency, the fundamental frequency in the ripple would be .....

A. 25 Hz

B. 50 Hz

C. 70.7 Hz

D. 100 Hz

Answer: D

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12. Ratio of number density of holes is $\frac{7}{5}$ and ratio of their current is $\frac{7}{4}$ in a semiconductor. The ratio of their drift velocity is .....

A. $\frac{4}{7}$

B. $\frac{5}{8}$

C. $\frac{4}{5}$

D. $\frac{5}{4}$

Answer: D

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13. Which of the following is true ?

A. 

B. 

C. 

D. '  '

Answer: B

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14. A charge of 2×10^{-2} C moves at 30 revolutions per second in a circle of diameter 80 cm. The current linked with the circuit is .....

A. 2.31

B. 1.33

C. 1.71

D. 2.0

Answer: D

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15. A solid which is transparent to visible light an whose conductivity increases with temperature is formed by .....

A. ionic bonding

B. covalent bonding

C. van-der-walls bonding

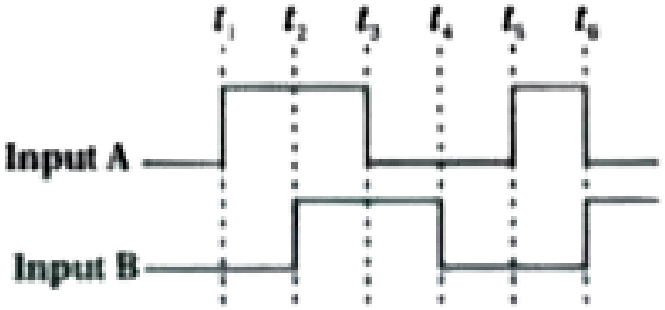
D. metalic bonding

Answer: B

Watch Video Solution

16. As shown in the following figure take A and B input waveforms.

Sketch the output waveform obtained from NAND gate.



A. NAND gate

B. OR gate

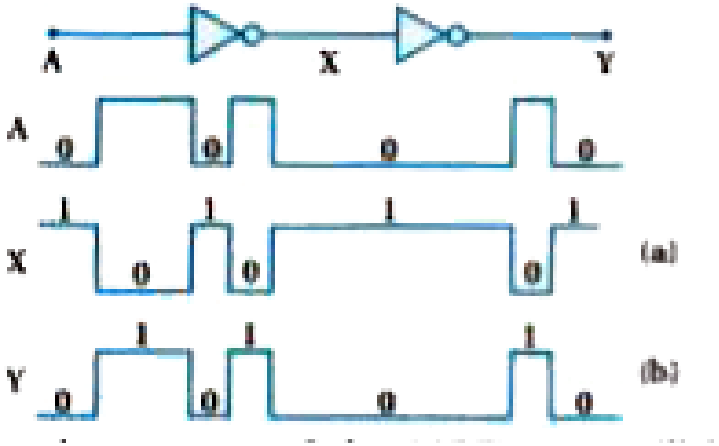
C. NOR gate

D. AND gate

Answer: B

Watch Video Solution

17. A logic circuit is shown in the diagram. Draw the output signal at the point X and Y for the input signal shown in the figure at point A.



A. 

B. 

C. 

D. 

Answer: D

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18. Carbon, silicon and germanium have four valence electrons each. At room temperature which one of the following statements is most appropriate?

A. The number of free conductioin electrons is significant in C but small in Si and Ge.

B. The number of free conduction electrons is negligible small in all the three.

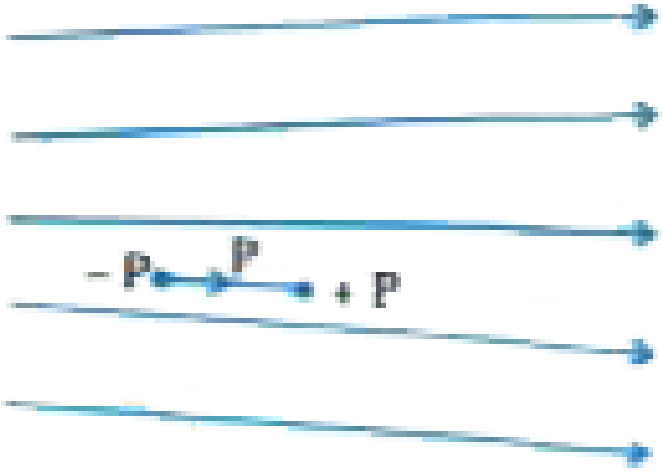
C. The number of free electrons for conduction is significant in all the three.

D. The number of free electrons for conduction is significant only in Si and Ge but small in C.

Answer: C

 Watch Video Solution

19. Figure shows electric field lines in which an electric dipole P is placed as shown. Which of the following statements is correct ?



A. 

B. 

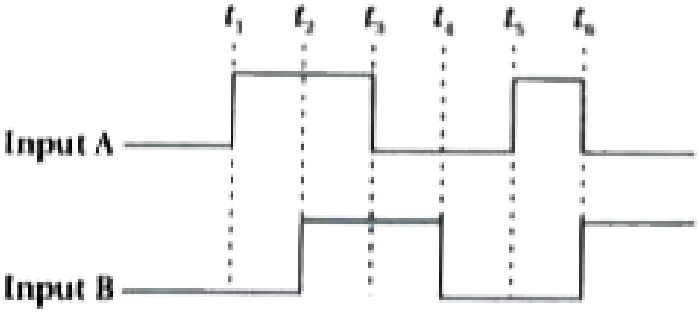
C. 

D. 

Answer: C

Watch Video Solution

20. As shown in the following figure, take A and B input waveforms. Sketch the output waveform obtained from AND gate.



A.

B.

C.

D.

Answer: A

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21. Which logic gate is represented by the following logic gates?

A. NAND gate

B. OR gate

C. NOT gate

D. XOR gate

Answer: B

Watch Video Solution

22. If the output of the OR gate is connected to both inputs of the NAND gate, then this combination acts as a .....

A. OR gate

B. NOT gate

C. NOR gate

D. AND gate

Answer: C

Watch Video Solution

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

Hence identify the exact logic operation carried out by this circuit.

A.

B.

C.

D.

Answer: A

Watch Video Solution

24. Why is $I \rightarrow V$ characteristic of a solar cell draw in the fourth quadrant of the coordinate system?

A.

B. 

C. 

D. 

Answer: B

Watch Video Solution

25. Which of the following is correct

A. 

B. 

C. 

D. 

Answer: D

Watch Video Solution

26. If A and B are invertible matrices, then which of the following is not correct

A. NOT

B. AND

C. OR

D. NAND

Answer: C

Watch Video Solution

27. Below is a list of plant fibres. From which part of the plant these are obtained ?

(a) Coir (b) Hemp (c) Cotton (d) jute

A. Simple diode, Zener diode, Solar cell, Light dependent resistance

B. Zener diode, Simple diode, Light dependent resistance, Solar cell

C. Solar cell, Light dependent resistance, Zener diode, Simple diode

D. Zener diode, Solar cell, Simple diode, Light dependent resistance

Answer: A

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28. For common emitter configuration, if α and β have their usual meanings, the incorrect relationship between α and β is :

A. $\frac{1}{\alpha} = \frac{1}{\beta} + 1$

B. $\alpha = \frac{\beta}{1-\beta}$

C. $\alpha = \frac{\beta}{1+\beta}$

D. $\alpha = \frac{\beta^2}{1+\beta^2}$

Answer: B

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29. If X is the number of tails in three tosses of a coin, determine the standard deviation of X.

A. 

B. 

C. 

D. 

Answer: C

Watch Video Solution

30. In a common emitter amplifier circuit using a n-p-n transistor, the phase difference between the input and the output voltages will be .....

A. 135°

B. 180°

C. 45°

D. 90°

Answer: B

Watch Video Solution

31. 

The output of the given circuit in figure.

A. 0

B. 15 mA

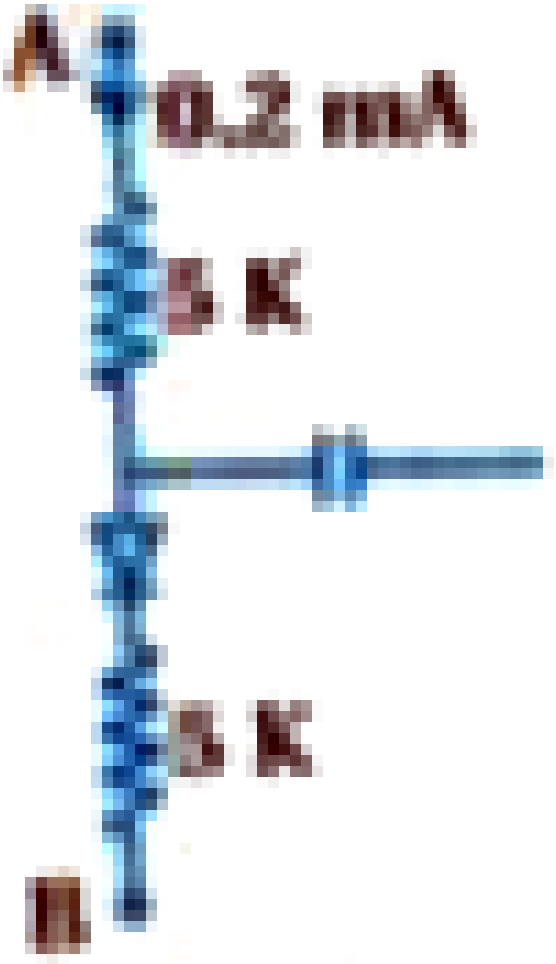
C. 11.5 mA

D. 13.5 mA

Answer: C

Watch Video Solution

32.



In the circuit shown in figure, if the diode forward voltage drop is 0.3 V, the voltage difference between A and B is

A. zero

B. 5 mA

C. 9 mA

D. 14 mA

Answer: C

Watch Video Solution

33. Which of the following is true ?

A. 

B. 

C. 

D. 

Answer: D

Watch Video Solution

34. What is the difference between a nucleotide and nucleoside ? Give two examples of each with their structure.

A. 0V

B. 15V

C. 10V

D. 5V

Answer: C

Watch Video Solution

35. Derive an expression for current I passing through an AC circuit containing only inductor L. Draw a Phasor diagram and graph of v and I versus ωt. Explain instantaneous power and the average power.

A. $A \cdot B$

B. $\overline{A} + B$

C. $A + B$

D. $\overline{A} \cdot \overline{B}$

Answer: D

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36. The depletion layer in the p-n junction region is caused by .....

A. drift of holes.

B. diffusion of charge carriers.

C. migration of impurity ions.

D. drift electrons.

Answer: C

Watch Video Solution

37. When a p-n junction diode is reverse biased, the flow of current across the junction is maninly due to .....

A. diffusion of charges

B. drift charges

C. both (A) and (B)

D. kind of material

Answer: B

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38. The output of OR gate is 1 .....

A. zero

B. same as the input

C. fullwave rectified halfwave rectified

D. halfwave rectified

Answer: D

Watch Video Solution

39. Barrier potential of a p-n junction diode does note depend on .....

A. doping density

B. diode design

C. temperature

D. forward bias

Answer: B

Watch Video Solution

40. Which gate will be obtained by joining the two inputs of the NAND gate?

A. NOR

B. AND

C. NAND

D. OR

Answer: B

Watch Video Solution

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41. Reverse bias applied to a junction diode .....

A. increase minority carrier current.

B. lowers the potential barrier.

C. raises the potential barrier.

D. increases majority carrier current.

Answer: C

Watch Video Solution

42. In semiconductor at a room temperature .....

A. the conduction band is completely empty.

B. the valence band is partially empty and the conduction band is partially filled.

C. the valence band is completely filled and conduction band is partially filled.

D. the valence band is completely filled.

Answer: C

Watch Video Solution

43. The peak voltage in the output of a half wave diode rectifier fed with a sinusoidal signal without filter is 10V. The d.c. component of the output voltage is .....

A. $\frac{20}{\pi}V$

B. $\frac{10}{\sqrt{2}}$V

C. $\frac{10}{\pi}V$

D. $10V$

Answer: C

Watch Video Solution

44. The output of OR gate is 1 .....

A. if either input are 0.

B. only if both inputs are 0.

C. only if both inputs are 1.

D. if either or both inputs are 1.

Answer: C

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45. Choose the only false statement from the following.

A. In conductors the value of conduction bands may overlap.

B. Substance with energy gap of the order of 10 eV are insulators.

C. The resistivity of a semiconductor increases with increase in temperature.

D. The conductivity of a semiconductor increases with increase in temperature.

Answer: C

Watch Video Solution

46. Application of a forward bias to a p-n junction .....

A. widens the depletion zone.

B. increases the potential difference across the depletion zone.

C. increases the number of donars on the n-side.

D. increases the electric field in the depletion zone.

Answer: C

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47. Zener diode use for ....

A. amplification

B. rectification

C. stablisation

D. oscillator

Answer: C

Watch Video Solution

48. An AND gate is followed by a NOT gate in series with two inputs A and B, the Boolean expresion for the output Y will be .....

A. NAND gate

B. NOR gate

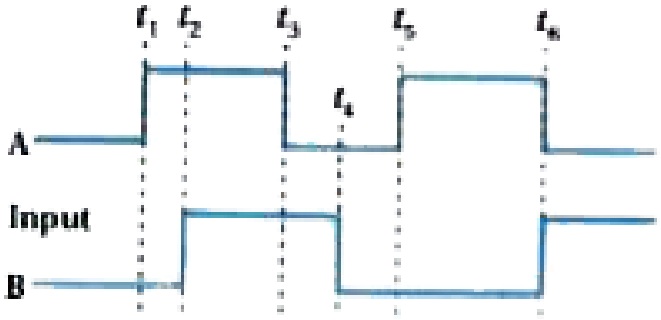
C. OR gate

D. AND gate

Answer: D

Watch Video Solution

49. Justify the output waveform (Y) of the OR gate for the following inputs A and B given in figure.



A.

B.

C.

D.

Answer: C

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50. In a semiconducting material the mobilities of electrons and holes are μ_e and μ_h respectively. Which of the following is true?

A. an insulator

B. a metal

C. a n-type semiconductor

D. a p-type semiconductor

Answer: D

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51. A p-n photodiode is made of a material with a band gap of 2.0 eV. The minimum frequency of the radiation that can be absorbed by the material is nearly .....

A. $10 \times 10^{14} Hz$

B. $5 \times 10^{14} Hz$

C. $1 \times 10^{14} Hz$

D. $20 \times 10^{14} Hz$

Answer: B

Watch Video Solution

52. Obtain the resonant frequency and Q-factor of a series LCR circuit with $L = 3.0H, C = 27\mu F,$ and $R = 7.4\Omega$. It is desired to improve the sharpness of the resonance of the circuit by reducing its 'full width at half maximum' by a factor of 2. Suggest a suitable way.

A. AND gate

B. NAND gate

C. NOR gate

D. OR gate

Answer: C

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53. A gas in equilibrium has uniform density and pressure throughout its volume. This is strictly true only if there are no external influences. A gas column under gravity, for example, does not have uniform density (and pressure). As you might expect, its density decreases with height. The precise dependence is given by the so-called law of atmospheres

$n_2 = n_1 \exp[-mg(h_2 - h_1)/k_B T]$

where n_2, n_1 refer to number density at heights h_2 and h_1 respectively. Use this relation to derive the equation for sedimentation equilibrium of a suspension in a liquid column:

$n_2 = n_1 \exp[-mgN_A(\rho - \rho')(h_2 - h_1)/\rho RT)]$ where ρ is the density of the suspended particle, and ρ', that of surrounding medium. [N_A is Avogadro's number, and R the universal gas constant.] [Hint : Use Archimedes principle to find the apparent weight of the suspended particle.]

A. (iv), (i), (iii)

B. (iv), (iii), (i)

C. (i), (iii) , (iv)

D. (iii), (iv), (ii)

Answer: B

Watch Video Solution

54. A p-n photodiode is fabricated from a semiconductor with a band gap of 2.5 eV. It can detect a signal of wavelength .....

A. 4000 nm

B. 6000 nm

C. 4000 Å

D. 6000 Å

Answer: C

Watch Video Solution

55. Which one of the following statement is false?

A. Pure Si doped with trivalent impurities gives a p-type semiconductor.

B. Majority carriers in a n-type semiconductor are holes.

C. Minority carriers in a p-type semiconductor are electrons.

D. The resistance of intrinisic of temperature.

Answer: B

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56. Which of the following device acts a complete electronic circuit?

A. Junction diode

B. Integrated circuit

C. Junction transistor

D. Zener diode

Answer: B

Watch Video Solution

57. Which of the following statement is true for the forward bias of a p-n junction?

A. The positive terminal of the battery is connected to p-side and the depletion region becomes thin.

B. The positive terminal of the battery is connected to n-side and the depletioin region becomes thin.

C. The positive terminal of the battery is connected to n-side and the depletion region becomes thick.

D. The positive terminal of the battery is connected to p-side and the depletion region become thick.

Answer: A

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58. If a small amount of antimony is added to germanium crystal .....

A. it becomes a p-type semiconductor.

B. the antimony becomes an acceptor atom.

C. there will be more free electron than holes in the semiconductor.

D. its resistance is increased.

Answer: C

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59. Pure Si at 500 K has equal number of electron (n_e) and hole (n_h) concentrations of $1.5 \times 10^{16} m^{-3}$. Doping by indium

increases n_h to $4.5 \times 10^{22} m^{-3}$. The doped semiconductor is of .....

A. n-type semiconductor, electron concentration $n_e = 5 \times 10^{22} m^{-3}$

B. p-type semiconductor, electron concentration $n_e = 2.5 \times 10^{10} m^{-3}$

C. n-type semiconductor, electron concentration $n_e = 2.5 \times 10^{23} m^{-3}$

D. p-type semiconductor, electron concentration $n_e = 5 \times 10^{9} m^{-3}$

Answer: D

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60. Keeping forward bias voltage from 0.6 V to 0.7 V in a p-n junction diode its current become 1 mA to 3mA. The dynamic resistance of diode is .....

A. 10 mA

B. 15 mA

C. 20 mA

D. 5 mA

Answer: D

Watch Video Solution

61. In a CE transistor amplifier, the audio signal voltage across the collector resistance of $2k\Omega$ is 2V. If the base resistance is $1k\Omega$ and

the current amplification of the transistor is 100, the input signal voltage is .....

A. 0.1 V

B. 1.0 V

C. 1 mV

D. 10 mV

Answer: D

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62. C and Si both have same lattice structure, having 4 bonding electrons in each. However, C is insulator where as Si is intrinsic semiconductor. This is because, ...

A. in case of C the valence band is not completely filled at absolute zero temperature .

B. in case of C the conduction band is partly filled even at absolute zero temperature.

C. the four bonding electrons in the case of C lie in the second orbit, whereas in the case of Si they lie in the third.

D. the four bonding electrons in the case of C lie in the third orbit, whereas for Si they lie in the fourth orbit.

Answer: C

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63. When the inputs of a two input logic gate are 0 and 0, the output is 1, when the inputs are 1 and 0, the output is zero. The

type of logic gate .....

A. OR gate

B. NOR gate

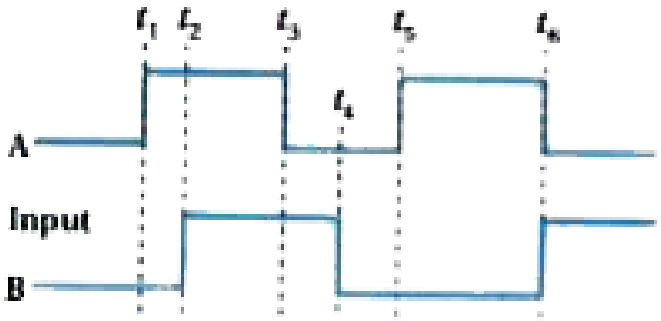
C. AND gate

D. NAND gate

Answer: A

Watch Video Solution

64. Justify the output waveform (Y) of the OR gate for the following inputs A and B given in figure.



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65.

The output of the given circuit in figure.

A. $X = A \cdot B$

B. $X = \overline{A + B}$

C. $X = \overline{\overline{A}} \cdot \overline{\overline{B}}$

D. $X = \overline{A \cdot B}$

Answer: A

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66. In a n-type semiconductor, which of the following statement is true?

A. Electrons are majority carriers and trivalent atoms are the dopants.

B. Electron are minority carriers and trivalen atoms are dopants.

C. Holes are minority carriers and pentavalent atoms are the dopants.

D. Holes are majority carriers and trivalent atoms are the dopants.

Answer: C

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67. The potential barrier of the p-n junction depends .....

(i) On kind of semiconductor material (ii) On amount of doping (iii) On temperature

A. Only (i) and (ii)

B. Only (ii)

C. Only (ii) and (iii)

D. Only (i), (ii) and (iii)

Answer: D

Watch Video Solution

68. In a n-type semiconductor, which of the following statement is true?

A. It is $V \rightarrow I$ characteristic for solar cell where point A represent open circuit voltage and point B short circuit current.

B. It is a for a solar cell and point A and B represent open circuit voltage and current respectively.

C. It is for a photodiode and points A and B represent open circuit voltage and current respectively.

D. It is for a LED and points A and B represent open circuit voltage and short circuit current respectively.

Answer: A

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69. A helicopter is moving in upward direction with speed of 10 m/s. If the length of the helicopter is 10 m and the horizontal component of magnetic field of earth is $1.5 \times 10^{-3} \frac{\text{Wb}}{m^2}$ then the induced emf produced across the foremost (nose) and end part (tail) of the helicopter will be ____

A. 

B. 

C. 

D. 

Answer: D

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70. Which logic gate is represented by the following logic gates?

A. OR

B. NAND

C. AND

D. NOR

Answer: C

Watch Video Solution

71. A cell of emf E and internal resistance r is connected across an external resistance R. Plot a graph showing the variation of P.D. across R, verses R.

A. 35 mA

B. 30 mA

C. 40 mA

D. 20 mA

Answer: B

Watch Video Solution

72. Derive an expression for current I passing through an AC circuit containing only inductor L. Draw a Phasor diagram and

graph of v and I versus ωt. Explain instantaneous power and the average power.

A. $10^{-2}A$

B. $10^{-1}A$

C. $10^{-3}A$

D. 0A

Answer: A

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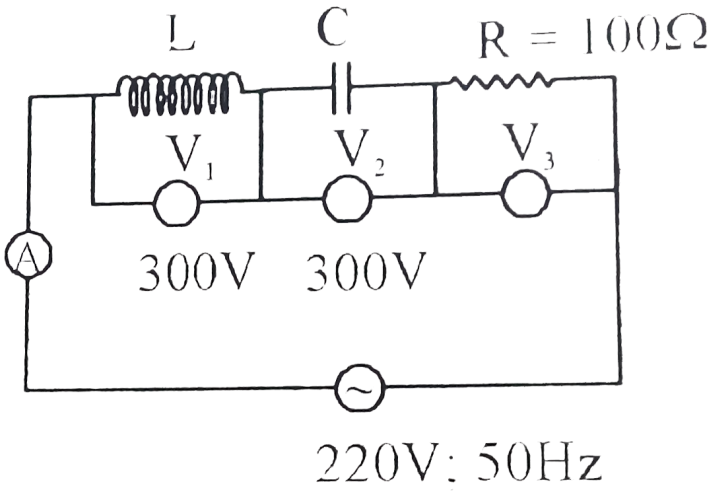
73. In the circuit shown the reading of voltmeter V_3 and Ammeter 'A' will be



A. 1.43A

B. 3.13 A

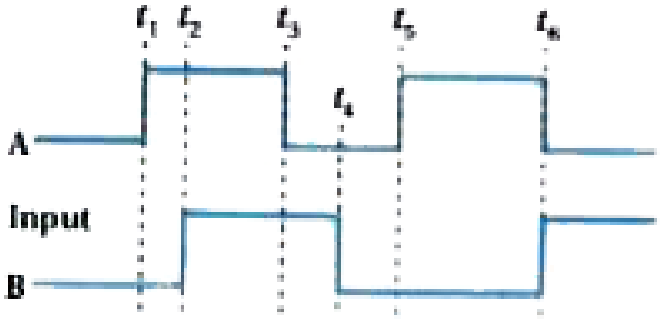
C. 2.5 A

D. 10.0 A

Answer: C

Watch Video Solution

74. Justify the output waveform (Y) of the OR gate for the following inputs A and B given in figure.



A. 1, 0

B. 1, 1

C. 0, 1

D. 0, 0

Answer: A

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75. If A and B are two matrices of the order $3 \times m$ and $3 \times n$, respectively, and m=n, then the order of matrix $(5A - 2B)$ is .....

A. 

B. 

C. 

D. 

Answer: A

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76. Which of the following logic gate is an universal gate?

A. NAND gate

B. AND gate

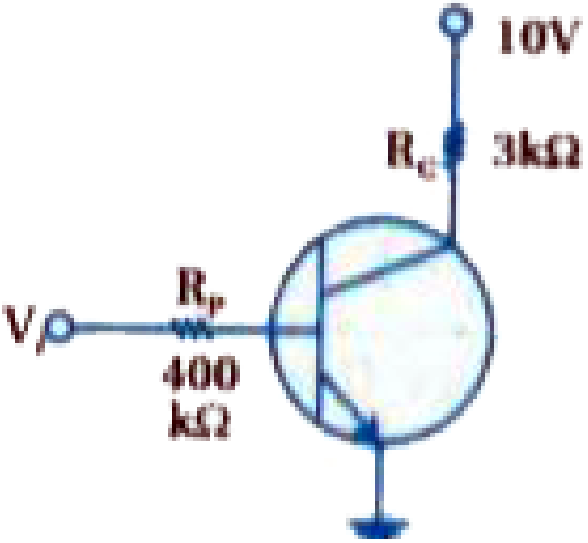
C. OR gate

D. NOT gate

Answer: A

Watch Video Solution

77.



In the circuit shown in figure, when the input voltage of the base

resistance is 10V, V_{BE} is zero and V_{CE} is also zero. Find the values of I_B, I_C and β.

A. $I_B = 40\mu A, I_C = 5mA, \beta = 125$

B. $I_B = 40\mu A, I_C = 10mA, \beta = 250$

C. $I_B = 20\mu A, I_C = 5mA, \beta = 250$

D. $I_B = 25\mu A, I_C = 5mA, \beta = 200$

Answer: A

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78. In a p-n junction diode, change in the temperature due to heating .....

A. affect the overall V-I characteristics of p-n junction.

B. affect only reverse resistance.

C. does not affect resistance of p-n junction.

D. affect only forward resistance.

Answer: A

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79. Which of the following can be used as a biocontrol agent in the treatment of plant disease ?

A. $\overline{\overline{A} + B}$

B. $\overline{\overline{A} \cdot B}$

C. $\overline{\overline{A} \cdot B} + A \cdot B$

D. $A \cdot \overline{B} + \overline{A} \cdot B$

Answer: D

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80. For a p-type semiconductor, which of the following statements is true?

A. Electrons are the majority carriers and pentavalent atoms are the dopants.

B. Electrons are majority carriers and trivalent atoms are the dopants.

C. Holes are the majority carriers and trivalent atoms are the dopants.

D. Holes are the majority carriers and pentavalent atoms are the dopants.

Answer: C

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81. Obtain the resonant frequency and Q-factor of a series LCR circuit with $L = 3.0H, C = 27\mu F,$ and $R = 7.4\Omega$. It is desired to improve the sharpness of the resonance of the circuit by reducing its 'full width at half maximum' by a factor of 2. Suggest a suitable way.

A. NOR

B. AND

C. OR

D. NAND

Answer: D

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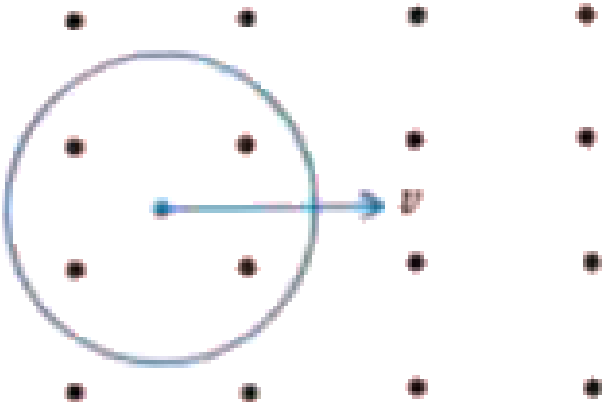
82. A circular loop enters a uniform magnetic field as shown in the figure. The current induced in the coil ____



A. 0

B. $\frac{i_0}{\pi}$

C. $\frac{2i_0}{\pi}$

D. i_0

Answer: C

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83. The rms value of a.c. signal in halfwave rectifier is .....

A. equal to value of D.C.

B. more than the value of D.C.

C. less than the value of D.C.

D. zero

Answer: B

Watch Video Solution

84. The valency of the impurity atom added to make germanium crystal into n-type semi-conductor have ....

A. 6

B. 5

C. 4

D. 3

Answer: B

Watch Video Solution

85. To a germanium sample, traces of galium are added as an impurity. The resultant sample would behave like .....

A. a good conductor.

B. a p-type semiconductor.

C. a n-type semiconductor

D. an insulator.

Answer: B

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86. When the semiconductor is heated .....

A. 

B. 

C. 

D. 

Answer: C

Watch Video Solution

87. Which logic gate is represented by the following logic gates?

A. OR

B. NAND

C. AND

D. NOR

Answer: C

Watch Video Solution

88. A Ge specimen is doped with Al. The concentration of acceptor atoms is $10^{21}\text{atoms}/\text{m}^3$. Given that the intrinsic concentration of electron hole pairs is $10^{19}/m^3$, the concentration of electrons in the specimen is .....

A. $10^{17}/m^3$

B. $10^{15}/m^3$

C. $10^4/m^3$

D. $10^2/m^3$

Answer: A

Watch Video Solution

89. Which of the following logic gate is an universal gate?

A. OR

B. NOT

C. AND

D. NAND

Answer: D

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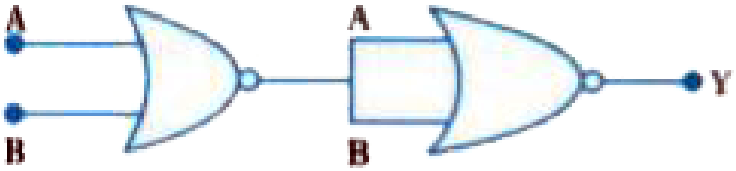
90. Write the truth table for circuit given in figure below consisting of NOR gates and identify the logic operation (OR, AND, NOT) which this circuit is performing.



A. AND

B. NOT

C. OR

D. NOR

Answer: A

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91. A light emitting diode (LED) has a voltage drop of 2 volt across it and passes a current of 10 mA when it operates with a 6 volt battery through a limiting register R. The value of R is .....

A. $40k\Omega$

B. $4k\Omega$

C. 200Ω

D. 400Ω

Answer: D

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92. In half wave rectification, what is the output frequency if the input frequency is 50 Hz.

A. 25 Hz

B. 50 Hz

C. 70.7 Hz

D. 100 Hz

Answer: B

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93. The forbidden gap in the energy bonds of silicons is .....

A. 2.6 eV

B. 1.1 eV

C. 0.1 eV

D. 6 eV

Answer: B

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94. Which among the following is applicable to tapetum?

(A) Protective layer

(B) Nourishing layer

(C) Vestigial part

(D) None of the above

A. NAND

B. OR

C. XOR

D. NOR

Answer: D

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95. When the inputs of a two input logic gate are 0 and 0, the output is 1, when the inputs are 1 and 0, the output is zero. The type of logic gate .....

A. XOR

B. NAND

C. NOR

D. OR

Answer: C

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96. Which logic gate is represented by the following logic gates?

A. OR

B. NOT

C. NAND

D. XOR

Answer: A

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97. The direction of the electric field in p-n junction diode is .....

A. from p-side to n-side

B. from n-side to p-side

C. randomly oriented

D. electric field does not exist

Answer: B

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98. When the electromagnetic radiation of maximum wavelength of 2480 nm is incident on semiconductor. The band gap energy of semiconductor is .....eV.

$\left[6.6 \times 10^{-34} JS, C = 3 \times 10^{8} m/s, 1eV = 1.6 \times 10^{-19} J\right]$

A. 0.9

B. 0.7

C. 0.5

D. 1.1

Answer: C

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99. To create AND gate require .....NAND gate.

A. 0

B. 1

C. 2

D. 3

Answer: C

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100. What kind of p-n junction diode does not require any kind of bias?

A. Photo diode

B. Vector diode

C. Solar cell

D. Transistor

Answer: C

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101. The doping of minute quantity of antimony to a silicon crystal makes it .....

A. a good insulator.

B. a p-type semiconductor.

C. a n-type semiconductor

D. a good conductor.

Answer: C

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102. How much is potential barrier in Si diode at room temperature?

A. 0.3 V

B. 0.7 V

C. 2 V

D. 1 V

Answer: B

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103. When will the conductivity of a Ge semiconductor decrease?

A. on dopping donor impurity.

B. on adding acceptor impurity

C. on making UV light incident

D. on decreasing the temperature

Answer: D

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104. Write the symbol, truth table, function and Boolean equation for OR gate.

A. $Y = \overline{A}$

B. $Y = A + B$

C. $Y = \overline{A} + \overline{B}$

D. $Y = A \cdot B$

Answer: B

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105. n-type semiconductor is obtained on doping intrinsic germanium by .....

A. phosphorus

B. aluminium

C. boron

D. gold

Answer: A

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106. A hole in a p-type semiconductor is ..... in a covalent bond.

A. an excess electron

B. a missing electron

C. a missing atom

D. a donor level

Answer: B

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107. An AND gate is followed by a NOT gate in series with two inputs A and B, the Boolean expresion for the output Y will be .....

A. $\overline{A+B}$

B. $\overline{A \cdot B}$

C. $A \cdot B$

D. $A+B$

Answer: B

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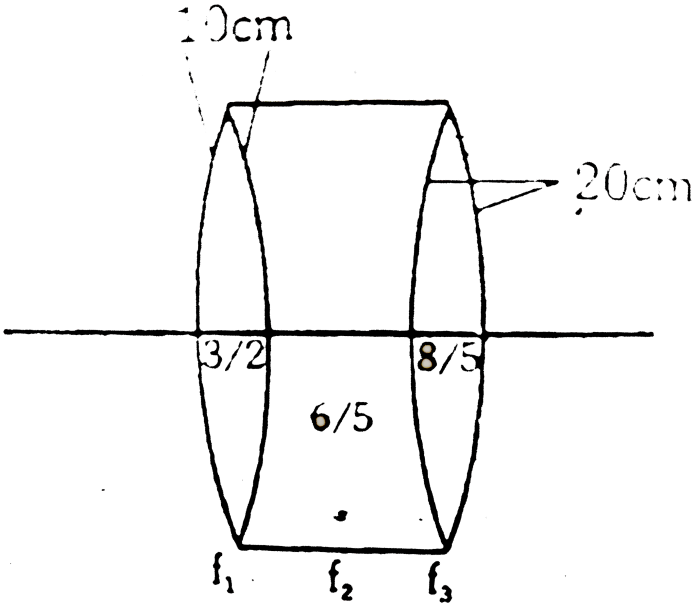
108. In the shown figure the focal length of equivalent system in the form of $\left(\frac{50x}{13}\right)$ .Find the value of x.



A. NOR gate

B. OR gate

C. AND gate

D. XOR gate

Answer: B

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109. Seperated p-type semiconductor is electrically .....

A. positively charged

B. negatively charged

C. neutral

D. none of these

Answer: C

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110. Name the gate, which represent the Boolean expression $y = \overline{A \cdot B}$

A. AND

B. NOR

C. NAND

D. NOT

Answer: C

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111. An electron hole pari is formed when light of maximum wavelength 6000 Å is incident on the semiconductor. What is the band gap energy of the semiconductor ? $\left(h = 6.62 \times 10^{-34} Js\right)$

A. $2.07 \times 10^{-19} J$

B. $2.07 J$

C. $3.31 \times 10^{-19} J$

D. $3.07 \times 10^{-19} J$

Answer: C

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112. The boolean expression of NOR gate is.....

A. 

B. 

C. 

D. 

Answer: A

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113. Which of the following is not a type of tissue ?

A. 1

B. 2

C. 4

D. 3

Answer: C

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114. The output of AND gate is 1, so .....

A. both input are zero.

B. one of input of both is zero.

C. none of true out of these.

D. both input are 1.

Answer: D

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115. The ratio of resistance of forward bias and reverse bias in p-n connection is .....

A. $\frac{1}{520}A$

B. $\frac{1}{24}A$

C. $\frac{1}{38}A$

D. $\frac{1}{15}A$

Answer: B

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116. A sinusoidal voltage of peak value 220 volts is connected to a diode and resistor R in the circuit shown. If diode is ideal the rms voltage across R is ..... volt.

A. 110

B. $\frac{110}{\sqrt{2}}$

C. 220

D. $\frac{220}{\sqrt{2}}$

Answer: D

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117. In a zener diode, the reverse bias voltage is 3V and width of the depletion region is 300 Å, the electric field intensity will be .....,

$\frac{V}{cm}$.

A. 10^4

B. 10^8

C. 10^6

D. 10^{-2}

Answer: C

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118. Gate can be obtained by shorting both the input terminals of a NOR gate is .....

A. OR

B. AND

C. NOT

D. NAND

Answer: C

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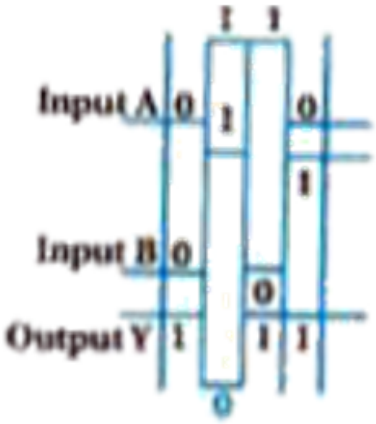
119. The figure shows the input signal A, input signal B and output signal Y. Which logic gate does it represent ?



A. NAND

B. AND

C. OR

D. NOR

Answer: A

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120. What kind of p-n junction diode does not require any kind of bias?

A. Vector diode

B. Solar cell

C. Photo diode

D. Transistor

Answer: B

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121. Which logic gate is represented by the following logic gates?

A. NAND

B. OR

C. AND

D. NOR

Answer: C

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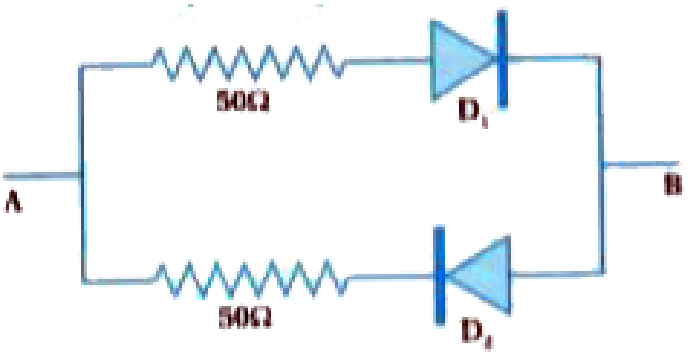
122. For the circuit shown in the figure, calculate the equivalent resistance for the two cases given as : (1) $V_A > V_B$ and $(2) V_B > V_A$. Here consider D_1 and D_2 to be ideal diodes.



A. $50, \infty$

B. $25, 25$

C. $\infty, 25$

D. $25, \infty$

Answer: D

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123. The value of β of a transistor is 19. The value of α will be .....

A. 0.93

B. 0.98

C. 0.99

D. 0.95

Answer: D

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124. The wavelength of photon having energy of 35 keV is .....

$\left(h = 6.625 \times 10^{-34} J - s, c = 3 \times 10^{8} m s^{-1}, 1eV = 1.6 \times 10^{-19} J\right)$

.

A. $35 \times 10^{-12} m$

B. 35 Å

C. 3.5 nm

D. 3.5 Å

Answer: A

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125. The band gaps of a conductor, semiconductor and insulator are respectively Eg_1, and Eg_2 and Eg_3. The relationship between them can be given as .....

A. $E_{g1} > E_{g2} < E_{g3}$

B. $E_{g1} > E_{g2} > E_{g3}$

C. $E_{g1} < E_{g2} > E_{g3}$

D. $E_{g1} < E_{g2} < E_{g3}$

Answer: A

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126. Which of following gates produces output of 1 ?

A. 

B. 

C. 

D. 

Answer: B

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127. The electric field for p-n junction is 1×10^6 V/m and depletion region is 5000 Å wide then the potential barrier = ... V.

A. 0.05

B. 0.005

C. 0.5

D. 5

Answer: C

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128. In p-n junction the width of space charge region is approximately ..... μm.

A. 0.5

B. 6

C. 5

D. 0.05

Answer: A

129. .....as a impurity, when added in Si or Ge P- type semiconductor is obtained.

A. Arsenic

B. Antimony

C. Phosphorus

D. Boron

Answer: D