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Class: XII
Subject: Physics
Topic: Electronic Devices
No. of Questions: 20
Duration: 60 Min
Maximum Marks: 60

1. p-n junction has a thickness of the order of
   a. 1 cm
   b. 1 mm
   c. 10^{-6} cm
   d. 10^{-12} cm

   Ans. C

   Solution:

   A p-n junction has a thickness of order of 10^{-6} cm.

2. Which of the following are not electromagnetic waves?
   a. cosmic rays
   b. gamma rays
   c. β–rays
   d. X-rays

   Ans. C

   Solution:

   β- rays are not electromagnetic waves

3. The question contains statement-1 (Assertion) and Statement-2 (Reason).
   The question has four choices. You have to select the correct choice.
   Assertion: NAND or NOR gates are called digital building blocks.

   Reason: The repeated use of NAND (or NOR) gates can produce all the basic or complicated gates.

   a. If statement-1 is true but statement-2 is false
   b. If statement-1 is false and statement-2 is true.

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c. If both statement-1 and statement-2 are true and statement-2 is the correct explanation of statement-1

d. If both statement-1 and statement-2 are true but statement-2 is not the correct explanation of statement-1

Ans. C

Solution:
These gates are called digital building blocks because using these gates only (either NAND or NOR) we can compile all other gates also (like OR, AND, NOT, XOR).

4. A full wave rectifier circuit along with the input and output voltages is shown in the fig.
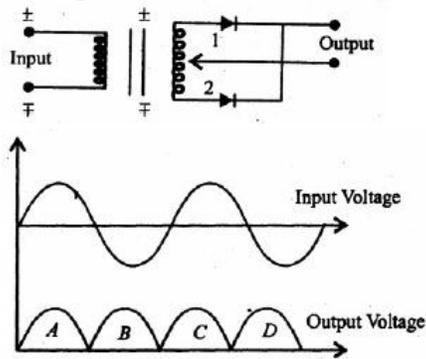
The contribution to output voltage from diode - 2 is
   a. A, C
   b. B, D
   c. B, C
   d. A, D

Ans. B
Solution:
As stated.

5. The reverse bias in a junction diode is charged from 5 V to 15 V the value of current changed from 38 ìA to 88 ìA. The reverse resistance of junction diode will be
   a. $4 \times 10^5 \Omega$
   b. $3 \times 10^5 \Omega$
   c. $2 \times 10^5 \Omega$

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d. $10^6\Omega$

Ans. C

$$\text{Reverse resistance} = \frac{\Delta V}{\Delta I} = \frac{(15-5)}{(88-38)\times10^{-6}} = 2\times10^5\,\Omega$$

6. What configuration of transistor is used for amplifying the voltage?

   a. CE
   b. CB
   c. CC
   d. None of the above

   Ans. A

7. What is the Boolean equation for the logic gate shown?

   a. $Y = A + \bar{B}$
   b. $Y = \overline{A + B}$
   c. $Y = \bar{A} + B$
   d. $Y = \bar{A} + \bar{B}$

   Ans. C
   Solution:
   As stated.

8. An intrinsic semiconductor at absolute zero of temperature behaves as
   a. an insulator
   b. a metallic conductor
   c. a superconductor
   d. a semiconductor

   Ans. A
   Solution;
   The phenomenon of spontaneous electron-hole pair generation is about at 0 K.

9. Read the statement carefully
   x: the resistivity of a semiconductor can be decreased by adding suitable impurity to it.

   Y: introduction of impurity to semiconductor creates excess charge carriers of one type.

Z: introduction of small quantity of the order 1 part per 10_6, controls the conductivity in the predictable manner.

Select the correct statement(s) from the following:

    a. both X and Y are true and Z is false

    b. both X and Y are true and Z is the correct reason for X

    c. both X and Y are true and Y is the correct reason for X

    d. X, Y and Z are true and Z is the correct reason for X

Ans. C

Solution;

As stated.

10. The following truth Table

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

is for

a. OR gate

b. AND gate

c. NOT gate

d. NOR gate

Ans. D

Solution:

d)

A	B	OR gate	NOR
0	0	0	1
1	0	1	0
0	1	1	0
1	1	1	0

Y corresponds to a NOR gate.

11. To a germanium sample, traces of gallium are added as an impurity. The resultant sample would behave like
    a. a conductor
    b. a p-type semiconductor
    c. an n-type semiconductor
    d. an insulator
    Ans. B
    Solution:
    As Ga belongs to.group IIIA it will form a p-type semiconductor.

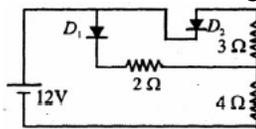12. The typical ionization energy of a donor in silicon is
    a. 1.0 eV
    b. 0.1 eV
    c. 0.01 eV
    d. 0.001 eV
    Ans. A
    Solution:
    Ionization energy of donor silicon =1.0 eV.

13. In the circuit of figure treat the diodes as ideal. Current in the 4 ohm resistor is

    a. 2 A
    b. 3 A
    c. 12/7 A
    d. 30/13 A

    Ans. A
    Solution;
    D_1 is forward biased and D_2 is reverse biased.
    So, no current will flow from D_2 or 3Ω.
    The $R_{eff} = 2\Omega + 4\Omega = 6\Omega$

    $$I_{4\Omega} = \frac{12\,V}{6\Omega} = 2\,A.$$

14. What is depletion region?

    a. Region where there are less charges

    b. Region where there are less of positive charges
    c. Region where charges move and forms an insulating region

    d. None of the above

    Ans. D

15. Read the passage and Answer the question below:
In a p-n junction, the current I can be expressed as

$$I = I_o \left(e^{\frac{eV}{kT}} - 1 \right)$$

Where I_o is called the reverse saturation current, V 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 is the Boltzmann's constant
$(8.6 \times 10^{-5} eVK^{-1})$ and T is the absolute temperature. If for a diode, $I_o = 5 \times 10^{-12}$A and T = 300 K, then

What is the dynamic resistance?
a. 0.0337Ω
b. 1.0223 Ω
c. 4.0556 Ω
d. 1.0042 Ω

Ans. A
Solution:
Now, I = 2.9643A;
$\Delta V = 0.7 - 0.6 = 0.1V$

Therefore, dynamic resistance

$= \dfrac{\Delta V}{\Delta I} = \dfrac{0.1}{2.9643} = 0.0337 \ \Omega$