

CHAPTER-14
Semiconductor Electronics, Materials,
Devices and Simple Circuits

ASSIGNMENT-2

MCQ-1 MARK

1. The mobility of free electrons is greater than that of free holes because
 - (a) they are light
 - (b) they carry negative charge
 - (c) they mutually collide less
 - (d) they require low energy to continue their motion
2. The forbidden gap for germanium is
 - (a) 0.12 eV
 - (b) 0.72 eV
 - (c) 7.2 eV
 - (d) None of these
3. Semiconductor devices require
 - (a) large evacuated space
 - (b) external heating arrangement
 - (c) low operating voltages
 - (d) high power
4. 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.
5. In a full wave rectifier, input AC has a frequency ' ν '. The output frequency of current is
 - (a) $\nu/2$
 - (b) ν
 - (c) 2ν
 - (d) None of these

ASSERTION/REASONING QUESTIONS

Directions : In the following questions, A statement of Assertion (A) is followed by a statement of Reason (R). Mark the correct choice as.

A: If both Assertion and Reason are correct and the Reason is a correct explanation of the Assertion.

B: If both Assertion and Reason are correct but Reason is not a correct explanation of the Assertion.

C: If the Assertion is correct but Reason is incorrect.

D: If both the Assertion and Reason are incorrect

6. **Assertion (A):** If the temperature of a semiconductor is increased then its conductivity increases.

Reason (R): The energy gap between conduction band and valence band is very small

7. **Assertion (A):** When a p-n junction diode is reverse biased, a feeble reverse-current flows known as reverse saturation current.

Reason (R): In reverse bias condition, the minority carries can cross the junction.

8. **Assertion:** The p-n junction diode primarily allows the flow of) current only in one direction (forward bias)

Reason: The forward bias resistance is low as compared to the reverse bias resistance.

9. **Assertion:** For a half wave rectifier the output frequency is half of input.

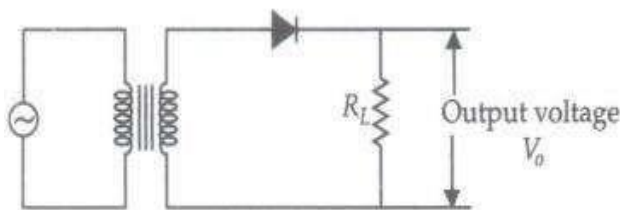
Reason: Half wave rectifier got its name from such phenomena.

10. **Assertion:** Diode is an Ohmic conductor.

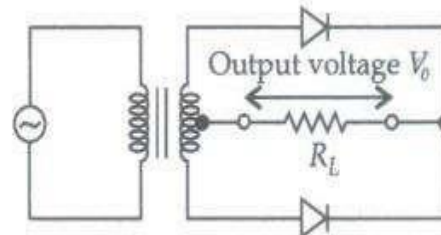
Reason: Diodes obey Ohm's law

CASE BASED / SOURCE BASED QUESTIONS

11. Rectifier is a device which is used for converting alternating current or voltage into direct current or voltage. Its working is based on the fact that the resistance of p-n junction becomes low when forward biased and becomes high when reverse biased. A half-wave rectifier uses only a single diode while a full wave rectifier uses two diodes as shown in figures (a) and (b).



(a) Half wave rectifier



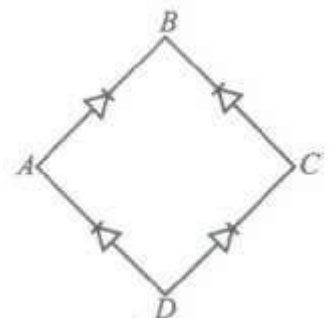
(b) Full wave rectifier

(I) If the rms value of sinusoidal input to a full wave rectifier is $V_0/\sqrt{2}$ then the rms value of the rectifier's output is

- (a) $V_0/\sqrt{2}$ (b) $V_0\sqrt{2}$ (c) $V_0/2$
 (d) $V_0/2$

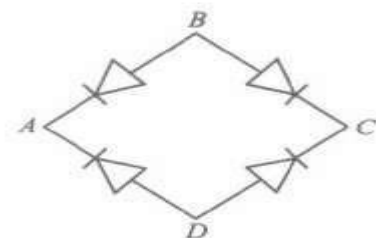
(II) In the-diagram, the input ac is across the terminals A and C. The output across B and D is

- (a) same as the input (b) half wave rectified (c) zero (d) full wave rectified

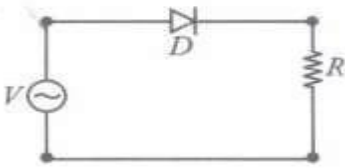


(III) A bridge rectifier is shown in figure. Alternating input is given across A and C. If output is taken across BD, then it is

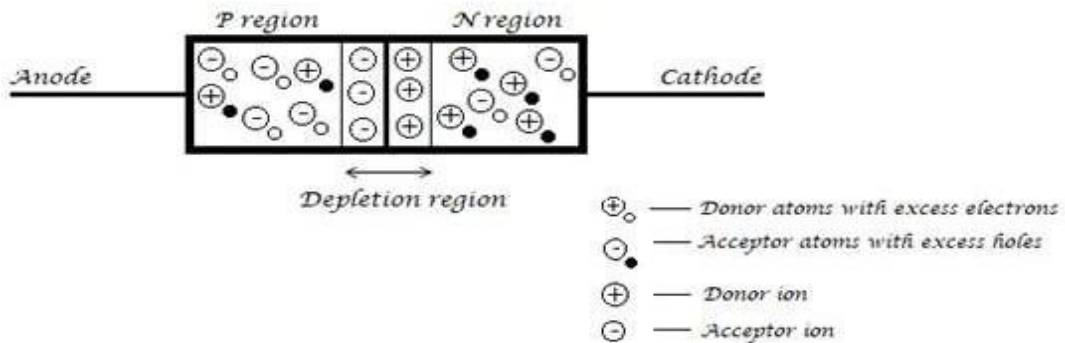
- (a) zero (b) same as input (c) half wave rectified (d) full wave rectified



(IV) A p-n junction (D) shown in the figure can act as a rectifier. An alternating current source V is connected in the circuit. The current (I) in the resistor(R) can be shown by



12.



P-N Junction diode when Unbiased

A p-n junction is a single crystal of Ge or Si doped in such a manner that one half portion of it acts as p-type semiconductor and other half functions as n-type semiconductor. As soon as a p-n junction is formed, the holes from the p-region diffuse into the n-region and electron from n region diffuse in to p-region. This results in the development of V_B across the junction which opposes the further diffusion of electrons and holes through the junction. The current set up by minority charge carriers under the influence of V_B is drift current. Diffusion current and drift current are in opposite directions and no net flow of charge across the junction.

(I) In an unbiased p-n junction electrons diffuse from n-region to p-region because

- (a) holes in p-region attract them
- (b) electrons travel across the junction due to potential difference
- (c) electron concentration in n-region is more as compared to that in p-region
- (d) only electrons move from n to p region and not the vice-versa

(II) In the depletion layer of unbiased p-n junction

(a) it is devoid of charge carriers (b) has only electrons (c) has only holes (d) p-n junction has a weak electric field

(III) The potential of depletion layer is due to

(a) electrons (b) hole (c) ions (d) forbidden band

(IV) Name the two important processes involved in the formation of a p-n junction.

2 MARKS QUESTIONS

13. Why does the Resistivity of Semiconductors go down with Temperature?

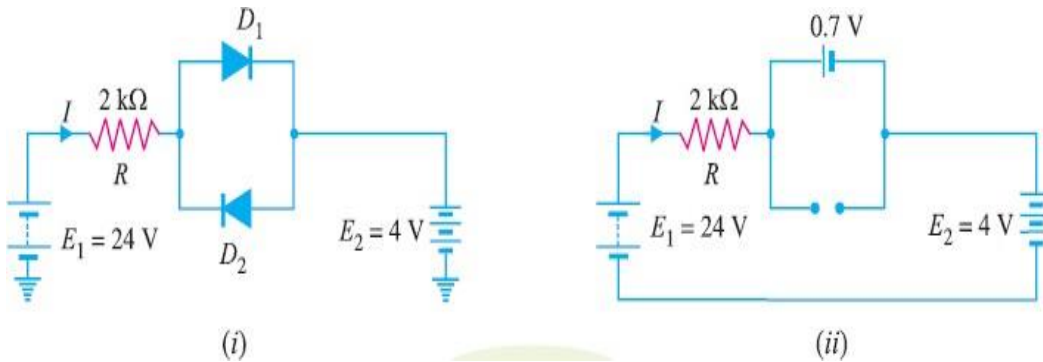
14. What is meant by intrinsic semiconductor and extrinsic semiconductor? What are the differences between intrinsic and extrinsic semiconductor?

15. What is meant by doping and doping agent?

16. Draw the voltage-current characteristic of a p-n junction diode in forwarding bias and reverse bias.

17. Explain, with the help of a circuit diagram, the working of a p-n junction diode as a full-wave rectifier. (CBSE-2011)

18. Determine the current I in the circuit shown below. Assume the diodes to be of silicon and forward resistance of diodes to be zero.



3 MARKS QUESTIONS

19. Write any two distinguishing features between conductors, semiconductors and insulators on the basis of energy band diagrams.

20 (i) Name two important processes that occur during the formation of a p-n junction.

(ii) Draw the circuit diagram of a full wave rectifier along with the input and output waveforms. Briefly explain how the output voltage/current is unidirectional. (CBSE 2016)

5 MARKS QUESTIONS

21. i) How are p- type semiconductors produced?
- ii) The forbidden band energy of silicon is 1.1eV. What does it mean?
- iii) What is an ideal diode?
- iv) Figure shows two p-n junction diode along with a resistance and a d.c battery E.
Indicate the path and the direction of appreciable current in the circuit.

