TEST SERIES 2019-20 **TEST NO. 5**

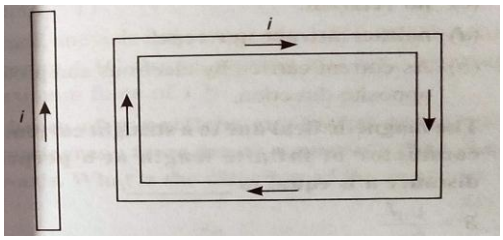
CH. 4 AND 14 **CONDUCTED ON 12TH JANUARY 2020**

Maximum Marks: 50 **Time Allowed: 2 hours**

- **Section A is of 1 mark questions. Question 1 to 12 are multiple choice questions.**
- **Section B consist of 10 questions of 3 marks each.**

SECTION A

1. **In the figure shown, the loop will**

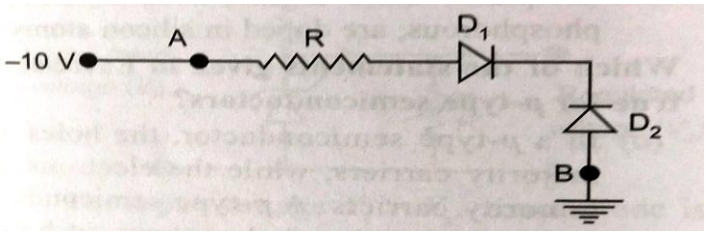


   (a) Rotate about an axis parallel to the wire.
   (b) Move away from the wire or towards right.
   (c) Move towards the wire.
   (d) Remain stationary.

2. **Biot savart law indicates that the moving electron (velocity v) produces a magnetic field B such that**
   (a) $B \perp v$
   (b) $B \parallel v$
   (c) It obeys inverse cube law
   (d) It is along the line joining the electron and point of observation

3. **An electron is projected with uniform velocity along the axis of a current carrying long solenoid. Which of the following is true?**
   (a) The electron will be accelerated along the axis
   (b) The electron path will be circular about the axis
   (c) The electron will experience a force at 45^{o} to the axis and hence execute a helical path.
   (d) The electron will continue to move with uniform velocity along the axis of the solenoid.

4. **In a cyclotron, a charged particle**
   (a) **Undergoes acceleration all the time**
   (b) **Speeds up between the dees because of magnetic field**
   (c) **Speeds up in dees**
   (d) **Slows down within a dee and speeds up between the dees.**
5. **If a charged particle moves through a magnetic field perpendicular to it**
   (a) **Both momentum and energy of particle change.**
   (b) **Momentum as well as energy are constant**
   (c) **Energy is constant but momentum changes**
   (d) **Momentum is constant but energy changes.**
6. **If the beams of electrons and protons move parallel to each other in the same direction, then they**
   (a) **Attract each other**
   (b) **Repel each other**
   (c) **No relation**
   (d) **Neither attract nor repel.**
7. **The conductivity of semiconductor increases with increase in temperature because**
   (a) **Number density of free carriers increases.**
   (b) **Relaxation time decreases**
   (c) **Both number density of carriers and relaxation time increases**
   (d) **Number density of carriers increases, relaxation time decrease but effect of decrease in relaxation time is much less than increase in number density.**
8. **In the given figure, assuming the diodes to be ideal**



   (a) **D1 is forward biased and D2 is reverse biased**
   (b) **D2 is forward biased and D1 is reverse biased and hence no current flows from B to A**
   (c) **D1 and D2 are both forward biased and hence current flows from A to B**
   (d) **D1 and D2 are both reverse biased and hence current flows from A to B**
9. **What happens during regulation action of a zener diode?**
   (a) **The current in and voltage across the zener diode remains fixed**
   (b) **The current through the series resistance does not change**
   (c) **The zener resistance is constant**
   (d) **The resistance offered by zener changes.**

10. An n-type semiconductor is

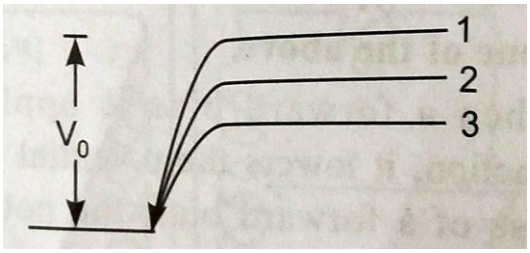
(a) Negatively charged

(b) Positively charged

(c) Neutral

(d) None of these

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



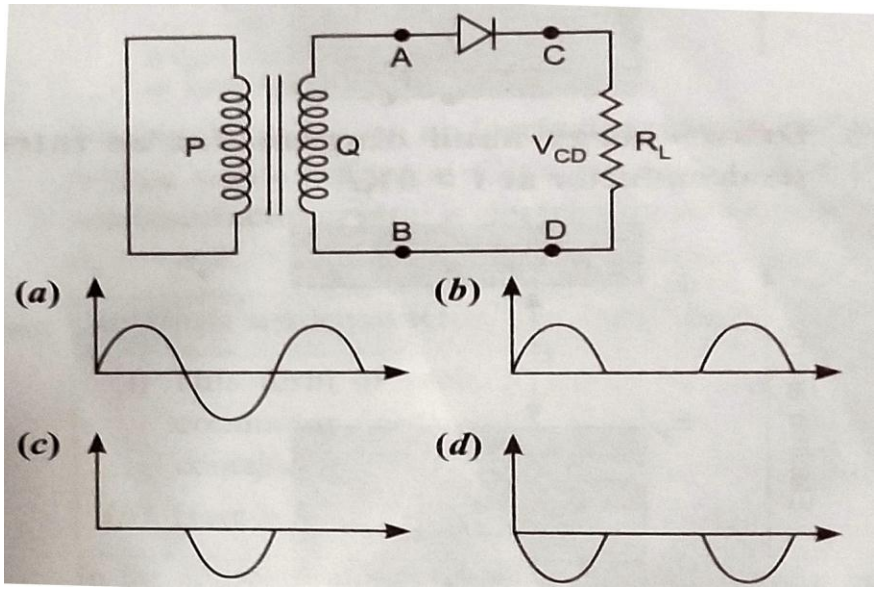
(a) 1 and 3 both correspond to forward bias of junction

(b) 3 corresponds to forward bias and 1 corresponds to reverse bias

(c) 1 corresponds to forward bias and 3 corresponds to reverse bias

(d) 1 and 3 both correspond to reverse bias of junction

12. Which of the following waveform is true for voltage across C and D?



13. Why are the elemental dopants mainly taken from 13th and 15th group, for doping Silicon or Germanium?

14. State the reason, why GaAs is most commonly used in making of a solar cell?

15. Why is a typical solar cell characteristics drawn in fourth quadrant?

16. In full wave rectification, what is the output frequency if the input frequency is 50 Hz?

17. Magnetic field lines can be entirely confined within the core of a toroid, but not within a straight solenoid. Why?

18. Write two properties of a material used as a suspension wire in a moving coil galvanometer.

19. What is figure of merit of a galvanometer?

20. An ammeter is ……resistance galovanometer.

SECTION B

21.

(a) Describe briefly how a galvanometer can be converted into an ammeter.

(b) A galvanometer with a coil of resistance 15 Ω shows full scale deflection for a current of 4 mA. How will you convert the meter into an ammeter of range 0 to 6 A.

22. A proton, a deuteron and an alpha particle, are accelerated through the same potential difference and then subjected to a uniform magnetic field, perpendicular to the direction of their motions. Compare (i) their kinetic energies and (ii) if the radius of the circular path described by proton is 5 cm, determine the radii of the path followed by deuteron and alpha particle.

23.

(a) State the underlying principle of a moving coil galvanometer.

(b) Give two reasons to explain why a galvanometer cannot as such be used to measure the value of current in a given circuit.

(c) Define the terms: (i) voltage sensitivity and (ii) current sensitivity of a galvanometer.

24.

(a) State Biot-Savart's law and express this law in vector form.

(b) Two identical coils, P and Q each of radius R, carrying currents 1 A and $\sqrt{3}$ A respectively, are placed concentrically and perpendicular to each other lying in XY and YZ planes. Find the magnitude and of the net magnetic field at the centre of the coils.

25. Two long straight parallel conductors carry steady current I_1 and I_2 separated by a distance d. if the currents are flowing in the same direction, show how the magnetic field set up in one produces the attractive force on the other. Obtain the expression for this force. Hence define one Ampere.

26. Use biot savart's law to derive the expression for the magnetic field on the axis of a current carrying circular loop of radius R. Draw the magnetic field lines due to circular wire carrying current.

27. Explain, with the help of a circuit diagram, the working of a p-n junction diode as a full wave rectifier.

28. Explain with the help of a diagram, how depletion region and potential barrier are formed in a junction diode.
29. With what consideration in view, a photodiode is fabricated? State its working with the help of a suitable diagram.

    Even though the current in the forward bias is known to be more than in the reverse bias, yet the photodiode works in reverse bias. What is the reason?
30. Draw V-I characteristics of a p-n junction diode. Answer the following questions, giving reasons:
    (a) Why is the current under the reverse bias almost independent of the applied voltage up to a critical voltage?
    (b) Why does the current under reverse bias show a sudden increase at the critical voltage?

    Name any semiconductor device which operates under the reverse bias in the breakdown region.

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