Reg. No. ☐☐☐☐☐☐☐☐☐☐☐☐☐

| Question Paper Code | 12991 |

B.E. / B.Tech. - DEGREE EXAMINATIONS, NOV / DEC 2024
Second Semester

Electronics and Communication Engineering
(Common to Electrical and Electronics Engineering)

20BSPH201 - PHYSICS OF ELECTRONIC DEVICES

Regulations - 2020

Duration: 3 Hours   Max. Marks: 100

PART - A (MCQ) (20 × 1 = 20 Marks)
Answer ALL Questions

		Marks	K–Level	CO

1. Average time taken by a free electron between two successive collision is called as — 1, K2, CO1
   (a) Mean free path (b) Collision time (c) Drift velocity (d) Relaxation time

2. Semiconductors have resistivity ------------ — 1, K1, CO1
   (a) between conductor and insulator   (b) more than insulators
   (c) depends on the property of semiconducting material   (d) less than conductors

3. In the case of insulators, as the temperature decreases resistivity ------- — 1, K2, CO1
   (a) decreases   (b) remains constant   (c) becomes zero   (d)increases

4. Example for dia-magnetic materials are ----- — 1, K1, CO2
   (a) super conductors   (b) alkali metals (c) transition metals (d) Ferrites

5. The substances which are attracted by the magnetic field are -------- — 1, K1, CO2
   (a) diamagnetic (b) paramagnetic (c) ferromagnetic (d) ferrimagnetic

6. Example for hard magnet — 1, K1, CO2
   (a) permalloy   (b) CrO_2 (c) Fe-Pd   (d) Alnico

7. Dielectric strength of a material implies its ----- — 1, K2, CO3
   (a) energy storage capacity   (b) magnetic strength
   (c) capacity to withstand high voltage   (d) none of the above.

8. The process of producing --------by an electric field is called polarization in dielectrics. — 1, K1, CO3
   (a) Electric dipoles (b) Aligned electrons (c) Magnetic dipoles   (d) Polar molecules

9. When the electrical field is applied to the dielectric, the positive nucleus moves towards the field direction and negative electron moves in opposite direction of field is explained by--------- — 1, K2, CO3
   (a) Lorentz force   (b) Coulomb force   (c) Electric force   (d) Magnetic force

10. Addition of pentavalent impurity to a semiconductor creates many ….. — 1, K2, CO4
    (a) Free electrons   (b) Holes   (c) Valence electrons   (d) Bound electrons

11. The random motion of holes and free electrons due to thermal agitation is called as — 1, K1, CO4
    (a) Diffusion   (b) Pressure   (c) Ionisation   (d) None of the above

12. Between the peak point and the valley point of tunnel diode, there is -------region. — 1, K2, CO4
    (a) Saturation   (b) Negative resistance   (c) Cut-off   (d) None of the above

13. The number of depletion layers in a transistor is ………… — 1, K1, CO5
    (a) four   (b) three   (c) one   (d) two

14. In a npn transistor, ……………. are the minority carriers — 1, K1, CO5
    (a) free electrons (b) holes   (c) donor ions   (d) acceptor ions

15. The relation between β and α is ………….. — 1, K2, CO5
    (a) β = 1 / (1 – α)   (b) β = (1 – α) / α   (c) β = α / (1 – α)   (d) β = α / (1 + α)

16. The C-B configuration is used to provide which type of gain? — 1, K1, CO5
    (a) voltage   (b) current   (c) resistance   (d) power

17. In a JFET, gates are always----- — 1, K1, CO6
    (a) Unbiased (b) Reverse biased (c) Either forward or reverse biased (d) Forward biased

K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate; K6 – Create   **12991**

18. One of the major applications of JEFT is in---- 1 K1 CO6
    (a) Switching   (b) Electron flow regulation
    (c) Constant voltage source   (d) Constant current source
19. In P-channel FET the current is due to-------- 1 K2 CO6
    (a) Electrons   (b) Holes   (c) Both holes and electrons   (d) Either holes or electrons
20. Saturation region of a JFET is also known as.........region 1 K1 CO6
    (a) Pinch off   (b) Analog   (c) Source   (d) Ohmic

PART - B (10 × 2 = 20 Marks)
Answer ALL Questions

21. Obtain the microscopic form of ohm's law.	2	K2	CO1
22. What is Fermi energy level? Give its significance.	2	K1	CO1
23. Define intensity of magnetization.	2	K1	CO2
24. State Curie Weiss law.	2	K1	CO2
25. What is meant by polarization in dielectrics?	2	K1	CO3
26. What are the various types of dielectric breakdown?	2	K1	CO3
27. What is meant by Transition and diffusion capacitance?	2	K1	CO4
28. What is meant by Reverse recovery time of a diode?	2	K1	CO4
29. Why BJT is called current controlled device?	2	K2	CO5
30. Which is meant by Pinch Off Voltage?	2	K1	CO6

PART - C (6 × 10 = 60 Marks)
Answer ALL Questions

31. a) Deduce mathematical expression for electrical conductivity and thermal conductivity of a conducting material. 10 K2 CO1

OR

    b) Define Fermi distribution function. Discuss the effect of temperature on Fermi Function based on the band theory of solids. 10 K2 CO1

32. a) Discuss briefly about the classification of magnetic materials based on magnetic moment / spin alignment. 10 K2 CO2

OR

    b) Explain the structure, properties and applications of Ferrites. 10 K2 CO2

33. a) Discuss any two types of polarization mechanism and the polarizability involved in dielectric materials. 10 K2 CO3

OR

    b) Derive an expression for Internal field. 10 K2 CO3

34. a) Derive an expression for the carrier concentration of electrons in an intrinsic semiconductor with neat energy band diagram. 10 K2 CO4

OR

    b) Discuss the construction, working and characteristics of a Laser diode. 10 K2 CO4

35. a) Explain the construction, working of a NPN transistor and also the input and output characteristic of CE configuration. 10 K2 CO5

OR

    b) Explain h parameter of transistor and draw the equivalent circuit of a transistor. 10 K2 CO5

36. a) Explain with a neat sketch the construction, working and characteristics of N-channel JFET. 10 K2 CO6

OR

    b) Explain the construction, working operation and characteristics of SCR with a neat sketch. 10 K2 CO6