24518

V Semester B.Sc. Degree Examination, November/December 2019

PHYSICS

Paper VI (5.2) – Statistical Mechanics, Quantum Mechanics and Electronics – I

(New)

Time : 3 Hours Max. Marks : 80

Instructions : *Write answers to Section A questions in the first two pages only.*

SECTION – A

Answer the following questions, each of **1** mark : **(15 × 1 = 15)**

1. Define phase space.
2. What is Stirling's approximation?
3. Name two particles involved in the Compton scattering.
4. Give an example for inelastic scattering.
5. What is Linear Harmonic Oscillator?
6. Mention the expression for energy of a Linear harmonic oscillator.
7. What is Eigen value?
8. Write an example for pentavalent impurity.
9. What is a semiconductor?
10. What is a conduction band?
11. What is π section filter?
12. What is PN junction?
13. What is meant by dark current of a photo diode?
14. What is Liquid crystal?
15. Write the expansion of MOSFET.

SECTION – B

Answer **any five** of the following : **(5 × 5 = 25)**

16. Explain the construction and working of Solar cell.

17. State and prove Boltzmann equipartition theorem.

18. Derive an expression for electrical conductivity of a semiconductor.

19. Explain the construction and working of Half wave rectifier and obtain the expression for efficiency of half wave rectifier.

20. Explain the construction and working of JFET with a neat circuit dicut diagram.

21. Illustrate the Heisenberg's uncertainty principle by diffraction at a single slit.

22. Derive an expression for energy of a particle in one dimensional box.

SECTION – C

Answer **any four** of the following : **(4 × 10 = 40)**

23. (a) Explain the working of npn transistor as an amplifier in CE configuration. And establish the relation between α and β.

    (b) Calculate emitter current for which $\beta = 120$ and base current 25 μA. **(8 + 2)**

24. (a) Compare Maxwell Boltzmann and Bose Einstein distribution function.

    (b) Write a note on Seven segment display. **(5 + 5)**

25. (a) Derive the Schrodinger time independent wave equation.

    (b) An electron is constrained in a one dimension box of side 1 Å. Calculate the lowest energy in eV, that an electron can have.

    Given: Mass of electron $= 9.11 \times 10^{-31}$ kg, $h = 6.625 \times 10^{-34}$ J.S. **(7 + 3)**

26. (a) What is Hall effect? Derive the expression for Hall coefficient.

    (b) Based on band theory of solids, distinguish between conductors, insulators and semiconductors. **(5 + 5)**

27. (a) Obtain the expression for Compton shift.

    (b) Calculate the debroglie wavelength of an alpha particle accelerated through a potential difference of 4 kV.

    Given: Mass of α-particle $= 6.64 \times 10^{-27}$ kg. **(7 + 3)**

28. Explain the construction, working and characteristics of MOSFET. **(10)**