UNIT 1

1. Derive an expression for Schrodinger time independent wave equation.
2. Derive an expression for Schrodinger time dependent wave equation.
3. Define wave function. Give its significance and write conditions for a wave function to be well behaved.
4. Derive an expression for the energy states of a Particle trapped in 1-dimensional potential box.
5. What is black body and what are the observations from the black body radiation graph?
6. State de Broglie hypothesis and derive equation of de Broglie wavelength.

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UNIT 2

7. Derive the expression for effective mass of an electron in valance and conduction band.
8. Classify the solids into conductors, semiconductors and insulators based on the Band theory.
9. Derive the expression for the concentration of electrons/ holes in conduction band (n-type semiconductors) / valence band (p-type semiconductors).
10. Explain how the position of Fermi level changes with doping concentration in N- type and P-type semiconductor.
11. Distinguish between direct and indirect band gap semiconductors.

UNIT 3

12. Discuss the physical and thermal properties of nanomaterials in comparison with that of the bulk materials.

13. (a) Define Nanomaterial. Explain quantum confinement in nanomaterials.

    (b) Discuss classification of nanomaterials based on dimensionality with examples.

UNIT 4

14. Explain components of a Laser.

15. Explain the construction, working, energy band diagram, and application of the He-Ne laser /Ruby Laser.

16. Write a note on the classification of Optical Fiber based on the mode of propagation and refractive index.

17. Discuss three-level and four-level pumping schemes in Laser.

18. Explain stimulated absorption, spontaneous emission, and stimulated emission. Derive relation between three Einstein coefficients.

19. Explain construction/structure of an optical fibre.

20. Define (a) Numerical Aperture (b) Acceptance Angle, of an optical fibre

UNIT 5

21. Differentiate between Optical Absorption and Optical Emission with an appropriate Diagram.

22. Explain the construction and working of the PIN photo diode with necessary diagram.

23. Explain the construction and working of the Photovoltaic cell with relevant diagram.

24. Explain the construction and working of LED with appropriate diagram.

NOTE: PREPARE THE NUMERICALS THAT EXPLAINED IN REGULAR CLASSES.