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PARUL UNIVERSITY
FACULTY OF ENGINEERING & TECHNOLOGY
B.Tech. Winter 2023-24 Examination

Semester:1/2
Subject Code: 303192102
Subject Name: Engineering Physics-II

Date:23-01-2024
Time: 02:00 pm to 04:30 pm
Total Marks: 60

Instructions:
1. All questions are compulsory.
2. Figures to the right indicate full marks.
3. Make suitable assumptions wherever necessary.
4. Start new question on new page.

Q.1 Objective Type Questions - **(15)**

(Each of one mark)

1. Nano tube is _____ material.
   (a) one dimensional (b) two dimensional
   (c) three dimensional (d) none of the above.
2. Fermi energy level for P type semiconductors lies_____
   (a) At middle of the band gap (b) Close to conduction band
   (c) Close to valence band (d) Can not predict
3. _____ means a minute piece of matter with defined physical boundaries.
   (a) Particle (b) Aggregate (c) Agglomerate (d) None
4. Which of the following is not a pumping process?
   (a) Optical pumping (b) Electrical pumping
   (c) Chemical pumping (d) Thermal pumping
5. _____ are commonly defined as materials with an average grain size less than 100nm.
   (a) semiconductors (b) nano materials (c) Quantum materials (d)None of the above
6. If Ψ is the wave function, the probability density function is given by_____ ($|\Psi|^2$ / $|\Psi|^3$)
7. In _____ (direct/indirect) band gap materials, momentum is conserved when electron makes transition from conduction band to valence band.
8. Write full form of LASER.
9. The _____ (Critical angle / Numerical Aperture) is a measure of the light-collecting ability of the fiber.
10. The optoelectronic device whose resistivity is the function of input intensity is____ (Photo conductive cell/ LED)
11. $Q_{op}\psi_i = q_i\psi_i$ represents eigen value equation. (where Q is operator, ψ_i is the wave function)
    a) True b) False
12. One-dimensional material has confinement in ___ dimensions and mobility in __ dimensions)
13. AlGaInP is _____ form of compound materials. (Ternary/Quaternary)
14. Define Aggregate and Agglomerate.
15. Define Bandgap.

Q.2 Answer the following questions. (Attempt any three) **(15)**

A) Explain the Physical significance of a Wave Function.
B) Explain E-K diagram with Direct and Indirect Bandgap.
C) Discuss the properties of LASER.
D) Write about photo Voltic cell.

Q.3 A) Derive an expression for Schrodinger time independent wave equation. **(07)**

B) Explain the construction, working, energy band diagram, and application of Ruby laser. **(08)**

OR

B) (i) Write a note on Light Emitting Diodes.

(ii) Calculate the energy of ejected photoelectron for the incident photon energy of 5 eV. The threshold energy of the photosensitive metal is 3.2 eV. **(08)**

Q.4 A) Explain the concept of effective mass and derive the equation of effective mass of electron in valance band and conduction band. **(07)**

OR

A) Discuss all 3 types of photo detectors. **(07)**

B). Discuss stimulated absorption, spontaneous emission and stimulated emission. **(08)**