Seat No: _____ Enrollment No: _____

PARUL UNIVERSITY

FACULTY OF ENGINEERING & TECHNOLOGY

B.Tech. Winter 2022-23 Examination

Semester: 1 **Date: 31/01/2023**
Subject Code: 303192102 **Time: 02:00 pm to 04:30 pm**
Subject Name: Engineering Physics-II **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 Compton shift depends on which of the following?
(a) Incident radiation (b) Nature of scattering substance
(c) Angle of scattering (d) Amplitude of frequency

2 Fermi energy level for intrinsic semiconductors lies_____
(a) At middle of the band gap (b) Close to conduction band
(c) Close to valence band (d) None

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 Nano tube is _____ **(**One-dimensional / Two-dimensional**)** material.

9 Refractive index vary _____ (Tangentially / Radially) in Graded Index fiber.

10 The optoelectronic device whose resistivity is the function of input intensity is____. (Photo conductive cell/ Photo Voltic cell)

11 A black body is defined as a perfect absorber of radiations. It may or may not be a perfect emitter of radiations.
a) True b) False

12 Zero-dimensional material has confinement in ___ dimensions and mobility in __ dimensions.

13 Write the full form of LASER.

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

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

B) Explain the construction, working, energy band diagram, and application of He-Ne Laser. **(08)**

OR

B) (i) Write a note on the Classification of Optical Fiber based on the mode of propagation and refractive index. **(08)**

(ii) The numerical aperture of optical fiber is 0.153. If the refractive index of core is 1.482, then calculate the refractive index of cladding.

Q.4 A) Explain the construction and working of the Avalanche Photo Diode. **(07)**

OR

A) Explain Stimulated absorption, Spontaneous emission and stimulated emission. **(07)**

B) Discuss in brief the classification of low dimensional materials based on their structure, dimension, confinement, and mobility. **(08)**