

Enrollment No: _____

PARUL UNIVERSITY
FACULTY OF ENGINEERING & TECHNOLOGY
B.Tech Mid Semester Exam

Semester: I
Subject Code: 303192102
Subject Name: Engineering Physics

Date: 21/11/2023
Time: 1hr: 30min
Total Marks: 40

Marks

05

Sr.
No.

Q.1 (A) Multiple Choice Question

1. _____ is the process by which an incoming photon of a specific frequency can interact with an excited atomic electron, causing it to drop to a lower energy level
 - a) Stimulated radiation
 - b) Stimulated absorption
 - c) Stimulated emission
 - d) Spontaneous absorption
2. What role do crystal lattices play in the formation of energy bands?
 - a) Crystal lattices disrupt band formation
 - b) Crystal lattices create energy bands
 - c) Crystal lattices are irrelevant to band formation
 - d) Crystal lattices only affect metallic properties
3. The value of fractional change in the refractive index (Δ) is always _____ for the optical fibers.
 - a) Positive
 - b) Negative
 - c) Zero
 - d) None of the above
4. Gas lasers have _____ scheme
 - a) Two level pumping
 - b) Three level pumping
 - c) Four level pumping
 - d) None of the above
5. Which of the following is/are the characteristics of LASER?
 - a) Coherent
 - b) Unidirectional
 - c) Highly intense
 - d) All of the above

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- (B) Do as directed**
1. What are the types of LASERS, specifically any one example from the Solid-state and Gas lasers?
 2. At higher temperature in intrinsic semiconductors, the position of fermi level gets slightly increased. **True or False**
 3. Mention two necessary conditions for the successful propagation of light from the optical fiber.
 4. Write down the types of the optical fibre based on the refractive index.
 5. Define Single mode optical fiber.

- Q.2 Attempt any four** 12
- (1) Explain the construction of the optical fiber in detail.
 - (2) Differentiate between Direct band gap and indirect band gap.
 - (3) An optical fiber has clad of refractive index (RI) 1.50 and numerical aperture (NA) 0.39. Find the RI of core and the acceptance angle (θ_{\max}).
 - (4) Derive an expression for the Effective mass (m^*).
 - (5) Explain the basic components of lasers.
- Q.3 Attempt any two questions** 08
- (1) Explain the classification of solid materials based on energy band gap.
 - (2) For an intrinsic semiconductor with a band gap of 0.7 eV, determine the position of E_F at $T = 300$ K if $m_h^* = 6m_e^*$.
 - (3) Calculate the Carrier concentration at 0K and deduce the equation of the fermi energy (E_F).
- Q.4** (A) Explain stimulated absorption, spontaneous emission and stimulated emission in detail 05
 (B) Discuss in detail the construction, theory and working of Ruby laser. 05
- OR
- (B) Derive an expression for the carrier concentration of the electrons in intrinsic semiconductor. 05