PARUL UNIVERSITY
FACULTY OF ENGINEERING & TECHNOLOGY
B.Tech. Winter 2018 - 19 Examination

Semester: 1   Date: 11/12/2018
Subject Code: 203192104   Time: 2:00pm to 4:30pm
Subject Name: Engineering Physics   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)**

1. Which one of the following is the unit of Density of states $\rho(k)$?
   a) m^{-2} b) m^{-3}
   c) J/s   d) m^3
2. Which of the following is the principle of LASER?
   a) Electroluminescence   b) Spontaneous Emission
   c) Induced absorption   d) None
   What is the carrier lifetime for intraband transition?
   a) 10^{-8}s to 10^{-9}s   b) 10^{-12}s to 10^{-13}s
   c) 10^{8}s to 10^{-15}s   d) None of the above
4. Under which of the following process the transitions involve the process of absorption and emission of Photon?
   a) Phonon transition   b) Acoustic transition
   c) Radiative transition   d) Non Radiative transition
5. 1nanometer = _____m
   a) 10^{-2} b) 10^{-3}
   c) 10^{-15} d) 10^{-9}

6. The full form of LASER is _____.

7. Under quasi equilibrium probability of emission is _____ than probability of absorption.
8. The distance between the boundaries of $+\frac{\pi}{a}$ to $-\frac{\pi}{a}$ is called as_____.

9. Intrinsic Carrier concentration depends on effective mass and Energy bandgap of the material.
   (True or False)
10. Photo detectors works in _____ bias condition.
11. What is Injection Efficiency (η_i)?
12. Define spontaneous emission.
13. Define Quantum Efficiency.
14. If we want to increase the Responsivity, its Quantum efficiency must not be changed.
    (True or False)
15. Give any one example of two dimensional nanostructure.

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

A) Derive the equation which gives the relation between for Rate of Carrier injection and excess carrier recombination time.

B) Write a note on Schottky Junction and Ohmic Contacts.

C) State any 5 applications of Photo detectors.

D) Write a note on Quantum Well, Quantum Wire and Quantum Dot.

Q.3 **A)** 1) Give any four difference between direct band gap and indirect band gap semiconductor. **(04)**

2) Write a short note on PIN diode. **(03)**

B) Mention the properties of LASER and also obtain the relation between Einstein's coefficients under thermal equilibrium. **(08)**

OR

B) 1) Obtain the equation which shows the relation between Quantum Efficiency and Responsivity. **(03)**

2) Draw the chart for materials which are used for LED and LASER. **(05)**

Q.4 **A)** 1) Write a short note on Quasi Fermi level. Obtain the expression for law of mass action under Boltzmann approximation. **(07)**

OR

A) 1) Write a short note on SLED. **(05)**

2) What are the general characteristics of Photo detector? **(02)**

B) Determine the equation for the Density of states for k-space and E-space with appropriate diagram. **(08)**