Code No: R13103 **R13** SET - 1

I B. Tech I Semester Supplementary Examinations, January - 2020
ENGINEERING PHYSICS
(Com. to ECE, EEE, EIE, E Com E, Agri E, Bio-Tech)

Time: 3 hours Max. Marks: 70

Note: 1. Question paper consists of two parts (**Part-A** and **Part-B)**
2. Answering the question in **Part-A** is Compulsory
3. Answer any **THREE** Questions from **Part-B**

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PART –A

1. a) Outline Fresnel theoretical explanation for diffraction phenomenon. (4M)

   b) Draw the energy level diagram of a ruby laser and explain how population inversion achieved in it. (4M)

   c) Explain electric polarization in dielectrics and mention various types of polarizations. (4M)

   d) Write down Maxwell's equations. (4M)

   e) Explain any two drawbacks of quantum free electron theory. (3M)

   f) Differentiate between direct semiconductors from indirect semiconductors. (3M)

PART -B

2. a) Explain the construction of quarter wave plate and half wave plate and obtain the expressions for their thickness. (8M)

   b) The refractive indices of quartz for light of wavelength 5890Å are 1.5539 for ordinary ray and 1.5634 for extra ordinary ray. Calculate the required thickness of the quartz crystal for making i) QWP and ii) HWP. (4M)

   c) What is an LED? Explain its working principle. (4M)

3. a) Derive the expression for numerical aperture of an optical fibre. Obtain the relation between numerical aperture and acceptance angle. (8M)

   b) The core of a glass fibre has a refractive index of 1.5 while its cladding is doped to give a fractional change in refractive index of 0.006. Find refractive index of cladding and the critical internal reflecting angle. (4M)

   c) Explain the origin of energy bands in solids. (4M)

4. a) Give a quantitative explanation of BCS theory of superconductors. How does this theory explain major characteristics of superconductors? (8M)

   b) Superconducting tin has a critical temperature of 3.7 K at zero magnetic field and a critical field of 0.0306 Tesla at 0 K. Calculate the critical field at 2 K. (4M)

   c) State Gauss's and Stoke's theorems. (4M)
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5. a) List out the factors that affect the architectural acoustics of a building and explain their remedy. (8M)

   b) State and explain Eyring formula. (4M)

   c) Distinguish between ferro, para and diamagnetic materials. (4M)

6. a) Obtain an expression for electrical conductivity based on classical free electron theory. (8M)

   b) Calculate the probability of the electrons occupying an energy level 0.02eV above the Fermi level at 200 K in a metal. (4M)

   c) Show that the atomic packing fraction of FCC is greater than BCC. (4M)

7. a) Derive an expression for the density of holes in an intrinsic semiconductor. How is the energy gap Eg of the semiconductor estimated? (8M)

   b) The energy gap in Ge is 0.67eV, the electron and hole effective masses are 0.12 m_e and 0.23 m_e respectively, where me is the free electron mass. Calculate the Fermi energy. (4M)

   c) Derive an expression for the path difference introduced by a parallel thin film for reflected rays. (4M)