Code No: R13203 **R13** **SET-1**

I B. Tech II Semester Supplementary Examinations, November - 2021
ENGINEERING PHYSICS
(Com. to CE, ME, CSE, PCE, IT, Chem. E, Aero E, Auto E, Min E, Pet E, Metal E & Textile Eng)

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) What is a diffraction grating? Explain with the help of a diagram. (4M)
   b) Derive an expression for the numerical aperture of an optical fibre in terms of fractional index change. (4M)
   c) Calculate the polarization produced in a dielectric medium of relative permittivity 15 in the presence of an electric field of 500V/m. (3M)
   d) A cinema hall has a volume of $7500m^3$. What should be the total absorption in the hall if a reverberation time of 1.5 seconds is to be maintained? (3M)
   e) Write a note on Fermi-Dirac statistical distribution law. (4M)
   f) Explain the working principle of a solar cell. (4M)

PART -B

2. a) What is Rayleigh's criterion of the limit of resolution? Obtain an expression for the resolving power of a plane diffraction grating. (8M)
   b) Explain the drift and diffusion currents in semiconductors. Describe in detail Einstein's relation between diffusivity and mobility. (8M)
3. a) Describe the construction and working of He-Ne laser with relevant energy level diagram. List out its advantages over a ruby laser. (8M)
   b) Explain the terms relaxation time, collision time and mean free path as applied to electric conduction. (8M)
4. a) Explain superconductivity. Briefly outline BCS theory of superconductivity. (8M)
   b) Define the terms coordination number, atomic radius and packing density. Calculate these factors for simple cubic crystals. (8M)
5. a) Discuss the factors affecting the architectural acoustics of a building and their remedy. (8M)
   b) Obtain the eigenvalues and normalized wave functions for a particle in a one-dimensional infinite potential box. (8M)
6. a) What is the density of energy states in metals? Derive an expression for density of energy states and hence obtain Fermi energy of metal. (8M)
   b) Classify magnetic materials on the basis of permanent dipole moment. (8M)
7. a) Derive an expression for carrier concentration in an intrinsic semiconductor. (8M)
   b) Analyze qualitatively Fraunhofer diffraction at the double-slit with suitable diagrams. (8M)

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