

I B. Tech I Semester Supplementary Examinations Sept. - 2014**ENGINEERING PHYSICS**

(Common to ECE, EEE, EIE, Bio-Tech, E Com E and Agri. E)

Time: 3 hours**Max. Marks: 70**

Question Paper Consists of **Part-A** and **Part-B**
 Answering the question in **Part-A** is Compulsory,
 Three Questions should be answered from **Part-B**

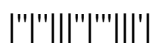
PART-A

- 1.(i) Derive an expression for the dispersive power of a plane diffraction grating.
- (ii) What are the characteristics of a LASER beam?
- (iii) Explain orientation polarization in dielectrics and discuss the effect of temperature on it.
- (iv) State and explain Fermi distribution function.
- (v) Write the Maxwell's electromagnetic equations in differential or integral form.
- (vi) What are Direct and Indirect band gap semiconductors?

[4+4+3+3+4+4]

PART-B

- 2.(a) State and explain the Principle of superposition of waves.
- (b) Derive the expression for Fermi energy in intrinsic semiconductor.
- (c) Explain the concept of Effective mass and derive the expression for it. [4+8+4]
- 3.(a) Explain the terms 'Acceptance angle' and 'Acceptance cone'.
- (b) Explain the formation of Newton's rings and obtain an expression for the diameter of the dark rings in reflected system.
- (c) Mention some applications of Hall effect. [4+8+4]
- 4.(a) Explain the important magnetic properties of ferro magnetic materials.
- (b) Classify the fibers on the basis of refractive index profile, modes and materials.
- (c) Newton's rings are formed with sodium light in an experiment. What is the order of the dark ring, which has double the diameter of the fourth dark ring? [4+8+4]
- 5.(a) What are the properties of Matter waves?
- (b) What is meant by Hysteresis? Explain ferro magnetic hysteresis on the basis of domain theory.
- (c) An optical fiber has a core and cladding materials of refractive indices of 1.55 and 1.50 respectively. The light is launched into the fiber from air. Calculate its numerical aperture. [4+8+4]
- 6.(a) Define valence band, conduction band and forbidden energy gap in the energy band structure.
- (b) Show that the solution of Schrodinger wave equation for a particle in an infinite potential well leads to the concept of quantization of energy.
- (c) Find the relative permeability of a ferro magnetic material if field of strength 220A/m produces a magnetization of 3300A/m in it. [4+8+4]
- 7.(a) Distinguish between Intrinsic and Extrinsic semiconductors.
- (b) Explain the Kronig-penny model of solids and show that it leads to energy band structure.
- (c) An electron beam is accelerated from rest through a potential difference of 200V. Calculate the associated wavelength. [4+8+4]



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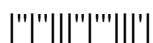
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PART-A

- 1.(i) What is a half wave plate? Deduce an expression for its thickness.
 - (ii) Distinguish between spontaneous and stimulated emissions.
 - (iii) Define dielectric susceptibility and polarisability of a dielectric. Write a relation connecting the two.
 - (iv) How will you measure the absorption coefficient of a material?
 - (v) Describe the formation of energy bands in a crystalline solid.
 - (vi) How does the Fermi level change with temperature in extrinsic semiconductors?
- [4+4+3+3+4+4]

PART-B

- 2.(a) What are the necessary conditions to get clear and distinct interference fringes?
 - (b) Explain Hall effect and derive an expression for Hall coefficient. Give any two of its applications.
 - (c) For the metal having 6.5×10^{28} conduction electrons per m^3 find the relaxation time of conduction electrons if the metal has resistivity $1.43 \times 10^{-8} \Omega m$.
- [4+8+4]
- 3.(a) Distinguish between crystalline solids and amorphous solids.
 - (b) Derive the conditions for path difference for interference in thin parallel film due to reflected light.
 - (c) An electric field of 100 V/m is applied to a sample of n-type semiconductor whose Hall coefficient is $-0.0125 m^3/C$. Determine the current density in the sample assuming $\mu_e = 0.6 m^2/V.s$.
- [4+8+4]
- 4.(a) State and explain Meissner effect.
 - (b) Derive the expression for inter planar distance between consecutive planes described by Miller indices (hkl).
 - (c) A half wave plate is designed from a crystal for $\lambda = 600 nm$. If $(\mu_o - \mu_e) = 0.0057$, calculate the thickness of the plate.
- [4+8+4]
- 5.(a) What are polar and non-polar dielectrics?
 - (b) Explain a.c. and d.c. Josephson's effect with theory.
 - (c) Silver has FCC structure and its atomic radius is 1.441 \AA . Find the spacing of (220) planes.
- [4+8+4]
- 6.(a) Explain the terms 'Drift velocity' and 'Carrier mobility'.
 - (b) Derive an expression for internal field seen by an atom in a dielectric material subjected to an electric field.
 - (c) Give any four applications of superconductors.
- [4+8+4]
- 7.(a) Write a notes on drift and diffusion currents.
 - (b) Based on classical free electron theory, derive an expression for electrical conductivity of metals.
 - (c) Write notes on Flux quantization.
- [4+8+4]



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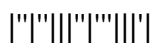
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PART-B

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