

**I B.Tech Examinations, May/June 2012  
ENGINEERING PHYSICS**

**Common to CE, ME, CHEM, MECT, MEP, AE, AME, MMT**

**Time: 3 hours**

**Max Marks: 80**

**Answer any FIVE Questions  
All Questions carry equal marks**

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1. (a) Describe the construction and uses of a nicol prism.  
(b) Write notes on
  - i. quarter-wave plate and
  - ii. half-wave plate.Give their uses.  
(c) The critical angle of a piece of glass is  $42^\circ$  for a monochromatic light beam. What is the polarizing angle? [6+6+4]
2. (a) What is meant by an acceptance angle for an optical fibre? Obtain mathematical expressions for acceptance angle and numerical aperture (NA).  
(b) An optical fibre has a NA of 0.20 and cladding refractive index of 1.59. Determine the refractive index of core and the acceptance angle for the fibre in water which has a refractive index of 1.33. [10+6]
3. (a) Describe edge and screw dislocations. Draw Burgers circuit and slip planes for them.  
(b) What do you understand by Frenkel defects? Derive the expression for concentration of Frenkel defects. [8+8]
4. (a) Discuss the necessary theory of interference in thin films by reflected light.  
(b) Describe Fraunhofer diffraction due to single slit quantitatively.  
(c) In a Newton's rings experiment a light of wavelength 5890 A.U. is used. The diameter of the 3<sup>rd</sup> dark ring is 3.2 mm. Find the radius of curvature of the lens? [6+6+4]
5. (a) What are DC and AC Josephson effects?  
(b) What is a SQUID? Explain its functioning.  
(c) Write any three applications of superconductivity. [8+5+3]
6. (a) Explain the terms:
  - i. Magnetic flux density
  - ii. Magnetic field strength
  - iii. Magnetization
  - iv. Magnetic susceptibility.How they are related to each other?

- (b) What are hard and soft magnetic materials? Write their characteristic properties and applications.
- (c) The magnetic field strength in silicon is 1000 amp/m. If the magnetic field susceptibility is  $-0.3 \times 10^{-5}$ ; calculate the magnetization and flux density in silicon. [6+6+4]
7. (a) Draw the (112) and (120) planes, and the [112] and [120] directions of a simple cubic crystal.
- (b) Derive an expression for the inter-planar spacing in the case of a cubic structure.
- (c) State and explain Bragg's Law in crystals. [4+6+4]
8. (a) With necessary theory and energy level diagram, explain the working of a Helium-Neon gas laser.
- (b) Mention some important applications of lasers. [10+6]

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