$$\boxed{\textbf{R5}}$$

B.Tech I Year(R05) Supplementary Examinations, December 2010
APPLIED PHYSICS
(Common to Electrical & Electronic Engineering, Electronics & Communication
Engineering, Computer Science & Engineering, Electronics & Instrumentation Engineering,
Bio-Medical Engineering, Information Technology, Electronics & Control Engineering,
Computer Science & Systems Engineering and Electronics & Computer Engineering)

Time: 3 hours   Max Marks: 80
Answer any FIVE Questions
All Questions carry equal marks
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1. (a) Explain the terms [6]
    i. basis
    ii. space lattice and
    iii. unit cell.
   (b) Describe the seven crystal systems with diagrams. [10]

2. (a) Explain Bragg's law of X-ray diffraction. [6]
   (b) Describe Laue's method for determination of crystal structure. [6]
   (c) A beam of X-rays is incident on a NaCl crystal with lattice spacing 0.282 nm. Calculate the wavelength of X-rays if the first order Bragg reflection takes place at a glancing angle of $8^o35'$. Also calculate the maximum order of diffraction possible. [4]

3. (a) Derive time independent Schrodinger's wave equation for a free particle. [8]
   (b) Explain the physical significance of wave function. [4]
   (c) An electron is bound in a one-dimensional infinite well of width 1×10^{-10}m. Find the energy values in the ground state and first two excited states. [4]

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

      [6]
   (b) Assuming the electron - lattice interaction to be responsible for scattering of conduction electrons in a metal, obtain an expression for conductivity in terms of relaxation time and explain any three draw backs of classical theory of free electrons. [6]
   (c) Find the temperature at which there is 1% probability of a state with an energy 0.5 eV above Fermi energy. [4]

5. (a) What is intrinsic break down in dielectric materials? [4]
   (b) Explain electronic polarization in atoms and obtain an expression for electronic polarisability in terms of the radius of the atom. [8]
   (c) A parallel plate capacitor has an area of 100 cm^2, with a separation of 1 cm and is charged to a potential of 100 V. Calculate the capacitance of the capacitor and the charge on the plates. [4]

6. (a) Distinguish between metals, semiconductors and insulators. [6]
   (b) Explain the effect of temperature on resistivity of a semiconductor. [4]
   (c) Derive an expression for the number of electrons per unit volume in the conduction band of an intrinsic semiconductor. [6]

7. (a) With neat diagrams, describe the construction and action of ruby laser. [10]
   (b) Write the applications of laser. [6]

8. (a) Derive expressions for numerical aperture and acceptance angle of an optical fibre. [10]
   (b) What is the principle of optical fibre communication? Explain. [6]

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