Code No: R7100203 **R7**

B.Tech I Year(R07) Supplementary Examinations, May/June 2010
APPLIED PHYSICS
(Common to Electrical & Electronics Engineering, Electronics & Communication Engineering, Computer Science & Engineering, Electronics & Instrumentation Engineering, Bio-Medical Engineering, Information Technology, Electronics & Control Engineering, Electronics & Computer Engineering and Computer Science & System Engineering))

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Show that FCC is the most closely packed of the three cubic structures by working out the packing factors. [10]
   (b) Describe the structure of NaCl. [6]
2. (a) Define Miller indices. Sketch the following atomic planes in a simple cubic structure (010), (110) and (111). [6]
   (b) Derive an expression for the inter-planar distance in terms of Miller indices for a cubic structure. [10]
3. (a) What are matter waves? Explain their properties. [6]
   (b) Derive the expression for de-Broglie wave length. [6]
   (c) Calculate the wavelength associated with an electron having energy 2000 eV. [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) With usual notation show that $P = \in_o (\in_r -1)E$ [6]
   (b) What is dipolar relaxation? Discuss the frequency dependence of orientational polarization. [6]
   (c) A solid elemental dielectric, with density 3×10^{28} atoms / m^3 shows an electronic polarisability of 10^{-40} farad-m^2. Assuming the internal electric field to be a Lorentz field, calculate the dielectric constant of the material. [4]
6. Explain the following: [6+5+5]
   (a) Critical magnetic field of a superconductor as a function of temperature.
   (b) Meissner effect.
   (c) Cryotrons.
7. (a) With necessary theory and energy level diagram, explain the working of a Helium-Neon gas laser. [10]
   (b) Mention some important applications of lasers. [6]
8. (a) Describe the construction of a typical optical fibre and give the dimensions of the various parts. [4]
   (b) Define the acceptance angle and numerical aperture. Obtain an expression for the numerical aperture of an optical fibre. [8]
   (c) Calculate the numerical aperture and acceptance angle for an optical fibre with core and cladding refractive indices being 1.48 and 1.45 respectively. [4]

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