Code No: R10203/R10 **Set No. 1**

I B.Tech II Semester Supplementary Examinations, February 2013
ENGINEERING PHYSICS -II
(Common to Civil Engineering, Electrical & Electronics Engineering, Mechanical Engineering, Electronics & Communication Engineering, Computer Science & Engineering, Chemical Engineering, Electronics & Instrumentation Engineering, Bio-Medical Engineering, Information Technology, Electronics & Computer Engineering, Aeronautical Engineering, Bio-Technology, Automobile Engineering, Mining and Petroliem Technology)

Time: 3 hours **Max Marks: 75**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Solve Schrodinger wave equation for one dimensional potential well defined by: V(x) = 8; x<0 and x>L V(x) = 0; 0 = x = L
   (b) A quantum particle confined to one dimensional box of width a is known to be in the first excited state. Determine the probability of the particle in the central half. [8+7]
2. (a) Derive an expression for thermal conductivity and electrical conductivity on the basis of classical free electron theory in a metal.
   (b) Discuss various drawbacks of classical free electron theory. [8+7]
3. (a) Explain the formation of allowed and forbidden energy bands on the basis of the Kronig- Penny model.
   (b) Write short notes on "effective mass" $(\mathbf{m}^*)$ of an electron. [8+7]
4. (a) Derive B = μ_0(H+I).
   (b) What are the properties of dia, para and ferromagnetic materials.
   (c) The magnetic field intensity in a piece of ferric oxide is 10^6A/m. If the susceptibility of the material is 1.5x10^{-3}, calculate the magnetization of the material and the flux density. [4+6+5]
5. (a) Explain the following: (i)Flux quantization. (ii)Penetration depth.
   (b) Explain critical magnetic field of a superconductor as a function of temperature.
   (c) For lead, Tc = 7.2^0K. Calculate the ratio of penetration depth at 3^0K to that at 0^0K. [6+5+4]
6. (a) Define dipolar polarizabilty and show that it varies inversely with temperature.
   (b) The polarizability of NH_3 molecule in gaseous state, from measurement of dielectric constant is found to be 2.5 x10^{-39}F-m^2 and 2 x10^{-39} F-m^2 at temperatures 300^0K and 400^0K respectively. Calculate the contribution to the polarizability because of deformation of molecules and the contribution because of permanent dipole moment at each temperature. [9+6]

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7. (a) What are drift and diffusion currents in semiconductors?
   (b) Derive their expressions and deduce Einstein's equation. [8+7]

8. (a) Write a detailed note on nano science and nanotechnology
   (b) Describe briefly the fabrication methods of nanomaterials [7+8]

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Code No: R10203/R10 **Set No. 2**

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ENGINEERING PHYSICS -II
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Time: 3 hours **Max Marks: 75**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) With suitable picturisation of potential well and imposing boundary conditions, derive Schrodinger wave equation for an electron and explain the variation of energy levels.
   (b) An electron is confined to a one dimensional potential box of length $2A^0$. Calculate the energies corresponding to second and fourth quantum states in eV. [8+7]

2. (a) Explain salient features of quantum free electron theory.
   (b) Mention and explain the assumptions made in quantum theory to overcome the drawbacks of free electron theory of metals [8+7]

3. (a) Discuss the motion of an electron in a periodic potential field and explain the formation of energy bands.
   (b) What is the effective mass of an electron? Derive the expression for the effective mass of an electron moving in energy bands of a solid. [7+8]

4. (a) Define the following
   (i)Magnetic moment
   (ii) Intensity of magnetization
   (iii) Magnetizing force
   (iv) magnetic flux density
   (b) Explain the origin of magnetic moment at the atomic level.
   (c) Find the relative permeability of a ferromagnetic material if a field of strength 110 A/m produces a magnetization of 3300 A/m. [8+5+2]

5. (a) Explain the following relating to superconductivity:
   (i) Critical temperature.
   (ii)Critical field.
   (iii)Critical current density.
   (iv)Isotope effect.
   (b) Mention some applications of super conductors. [8+7]

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6. (a) Define Piezoelectric and Pyroelectric materials.
   (b) Explain the applications of Ferroelectric and Piezoelectric materials. [8+7]

7. (a) Distinguish between intrinsic and extrinsic semiconductors with suitable examples.
   (b) The energy gap of an intrinsic semiconductor is 0.7 ev, calculate the concentration of intrinsic charge carriers at 300 K. Assuming that $m_e^* = m_h^* = m$ () rest mass of electron. [8+7]

8. (a) Define nanotechnology. What are the two types of nanofabrication? Write a note on one of the methods under each type
   (b) Explain briefly the surface occupancy & the reduction of dimensionality [9+6]

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Code No: R10203/R10 **Set No. 3**

I B.Tech II Semester Supplementary Examinations, February 2013
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Time: 3 hours **Max Marks: 75**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) What are matter waves. Explain their properties.
   (b) Show that the wave length λ associated with an electron of mass, m and Kinetic energy, E is given by$\lambda = \frac{h}{\sqrt{2mE}}$. Where h is planck's constant.
   (c) Calculate the wavelength associated with an electron with energy 2000eV [8+4+3]

2. (a) Write the assumptions of Drude and Lorentz theory?
   (b) Write main assumptions of Sommerfeld Electron Theory
   (c) How the drawbacks of Drude and Lorentz theory are explain in Sommerfeld Electron theory? [5+5+5]

3. (a) Explain how the atomic energy levels split in to bands when a number of atom are brought closer together to form a crystal?
   (b) What are Brillouin Zones? Discuss the formation of Brillouin Zones for linear lattice. [7+8]

4. (a) Derive B = μ_0(H+I).
   (b) What are the properties of dia, para and ferromagnetic magterials.
   (c) The magnetic field intensity in a piece of ferric oxide is 10^6A/m. If the susceptibility of the material is 1.5x10^{-3}, calculate the magnetization of the material and the flux density. [4+6+5]

5. (a) What is superconductivity? Write important features of superconductivity.
   (b) Distinguish Soft and Hard superconductors.
   (c) A superconducting tin has critical temperature of 3.7^0K and a critical field of 0.0306 tesla at 0^0K. Find the critical field at 2^0K. [5+6+4]

6. (a) What is orientation polarization? Give the expression for orientaional polarizability and discuss how does it depend on temperature.
   (b) Mention applications of dielectric materials. [9+6]

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7. (a) Distinguish between conductors, insulators and semiconductors.
   (b) The intrinsic carrier density at room temperature in Ge is 2.37X 10^{19} /m^3. If the electron and hole mobilities are 0.38 and 0.18 m^2 /v/s respectively, calculate the resistivity. [9+6]

8. (a) Discuss the density of state and Energy spectrum in a nanomaterial.
   (b) Mention the important applications of nanomaterials in Energy storage, materials technology, Information technology, Engineering & construction, Biomedical. [5+10]

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Code No: R10203/R10 **Set No. 4**

I B.Tech II Semester Supplementary Examinations, February 2013
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Time: 3 hours **Max Marks: 75**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Explain the Physical significance of Wave function.
   (b) Derive time dependent Schrodinger wave equation. [7+8]

2. (a) Explain the terms.
   (i)Drift velocity
   (ii) Mobility
   (iii) Mean free path
   (iv) Relaxation time of electron in metals.
   (b) Distinguish between classical free electron theory and quantum free electron theory of metals. [8+7]

3. (a) Explain the Kronig-Penney model for the energies of an electron in a metal.
   (b) Distinguish between conductors, semiconductors, and insulators. [9+6]

4. (a) What is ferromagnetic Hysteresis? Explain retentivity and coercivity. Explain ferromagnetic hysteresis on the basis of Domain theory?
   (b) Classify & Distinguish ferromagnetic materials on the basis of the hysteresis loop. [8+7]

5. (a) Super conductors are perfect diamagnetic substances- Explain.
   (b) Explain about existence of energy gap in superconductors.
   (c) For a superconducting specimen, the critical field are respectively 0.18 wb–m^2 0.53wb–$m^2$for 14^0K and 13^0K. Find the superconducting transition temperature and the critical field at 0^0K. [6+5+4]

6. (a) Explain the phenomenon of spontaneous polarization in ferroelectric materials.
   (b) Discuss the mechanisms that lead to dielectric break down. Explain electro-chemical break down in dielectric materials [8+7]

7. (a) Explain the mechanism of current conduction in n and p type semiconductors.

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(b) Explain the effect of temperature and doping concentration on the Fermi level in a n-type semiconductor. [8+7]

8. (a) Explain the fabrication of carbon nanotubes

(b) What are quantum wells, wires and dots. [9+6]

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