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

I B.Tech II Semester Supplementary Examinations, Feb/Mar 2014
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) Obtain Eigen values of energy, normalized wave functions of a particle in one dimensional potential box of side L.
   (b) An electron is bound in one dimensional infinite well of width $1x10^{-10}$m. Find the energy value of electron in the ground state and second excited state. [8+7]

2. (a) Explain the basic concept of Fermi energy. Calculate Fermi energy in eV for Silver at O^0K. The number of conduction of electrons in Silver is 5.863 x 10^{28} m^3.
   (b) Define relaxation time. Find relaxation time of conduction electrons in a metal of resistivity 1.54 x 10^{-8} Ohm-m. If the metal has $5.8x10^{28}$ conductions electrons / m^3. [8+7]

3. (a) Distinguish between metals, semiconductors and insulators on the basis of band theory of solids.
   (b) Define effective mass of an electron and derive an expression for it.

4. (a) Draw B-H curve for a ferromagnetic material and identify the retentivity and coercive field on the curve.
   (b) Explain the classification of magnetic material on the basis of area of the hysteresis.
   (c) The saturation magnetic induction of nickel is 0.65 Wb/m^2. If the density of nickel is 8906 $Kg/m^3$and its atomic weight is 58.7, calculate the magnetic moment of the nickel atom in terms of Bohr magneton. [6+4+5]

5. (a) Write general properties of superconductors.
   (b) Draw the magnetization curves for Type-I & Type-II superconductors and mention different regions.
   (c) The lead material works as superconductor at a temperature of $T_c = 7.26^0K$. If H_0= 8 x 10^5 A/m find critical magnetic field at 5^0K. [6+5+4]

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6. (a) Explain different types of polarization.
   (b) Derive Clausis-Mossotti Relation [6+9]

7. (a) Derive an expression for carrier concentration in intrinsic semiconductor.
   (b) The forbidden gap in pure silicon is 1.1eV. Compare the number of conduction electrons at temperatures 37^0C and 27^0C. [11+4]

8. (a) What are nanomaterials? Why do they exhibit different properties?
   (b) Write the applications of Nano Technology. [9+6]

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

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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) Assuming time independent Schrodinger wave equation, discuss the solution for a particle in one dimensional potential well of infinite height.
   (b) An electron is bound in one dimensional box of size 4 x 10^{-10} m. What will be its minimum energy. [8+7]

2. (a) Explain the basic concept of Fermi energy. Calculate Fermi energy in eV for Silver at O^0K. The number of conduction of electrons in Silver is 5.863 x 10^{28} m^3.
   (b) Define relaxation time. Find relaxation time of conduction electrons in a metal of resistivity 1.54 x 10^{-8} Ohm-m. If the metal has 5.8x10^{28} conductions electrons / m^3. [8+7]

3. (a) Explain Kronig-Penny Model.
   (b) What are Brillouin Zones? Discuss the formation of Brillouin Zones for linear lattice. [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) Distinguish the variation of resistivity with temperature in normal and superconductors.
   (b) Mention important property changes that occur in materials when they change from normal to superconducting state.
   (c) Write a short note on BCS theory. [4+7+4]

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6. (a) Define electric displacement. Derive the relation between Electric displacement (D), Electric field Intensity (E) and Polarization (P).
   (b) Discuss the frequency dependence of total polarizability in dielectric materials.
   (c) The dielectric constant of He gas at NTP is 1.0000684. Calculate the electronic polaizability of He atoms if the gas contains 2.7 x 10^{25}atoms/m^3. [6+5+4]

7. (a) Derive an expression for carrier concentration in intrinsic semiconductor.
   (b) The forbidden gap in pure silicon is 1.1eV. Compare the number of conduction electrons at temperatures 37^0C and 27^0C. [11+4]

8. (a) What is Quantum Confinement? Explain density of states for various types of Quantum Confinement.
   (b) Explain Ball Milling process and Sol-Gel process in nanomaterials. [8+7]

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

I B.Tech II Semester Supplementary Examinations, Feb/Mar 2014
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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) Show that the energies of a particle in a three dimensional potential box are quantized.
   (b) An electron is moving in a one dimensional box width $2x10^{-10}$m. If the electron is found in the first excited state what is the probability of finding the electron between x=0 and x= $1x10^{-10}$m. in that state. [8+7]

2. (a) Explain briefly the classical free electron theory of metals.
   (b) Derive an expression for electrical conductivity on the basis of classical free electron theory. [8+7]

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) What are ferromagnetic materials? What are its properties?
   (b) Discuss the behavior of a ferromagnetic material below the Curie temperature.
   (c) Explain internal field theory of ferromagnetism. [5+6+4]

5. (a) Explain the variation of specific heat with temperature in superconductors.
   (b) Write about different critical parameters that destruct the superconductive property.
   (c) Tc for two isotopes of mercury with atomic masses of 199.5u and 203.4u are found to be 4.185 ^{0}K and 4.146 ^{0}K respectively. Calculate the isotope effect coefficient. [5+6+4]

6. (a) With usual notation show that $\frac{p}{\varepsilon_o.E} = \varepsilon_r - 1$.
   (b) Obtain an expression for the internal field seen by an atom in an infinite array of atoms subjected to an external field. [6+9]

7. (a) Derive an expression for the carrier concentration in p-type semiconductor.

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(b) Determine the fraction of electrons in conduction band in silicon at 27^0C and 227^0C. given E_g=1.1eV and K=1.38X10^{-23} J/k. [11+4]

8. (a) Write the applications of nanomaterials in different fields.

(b) Explain 4D force vector. [10+5]

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

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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) Derive time independent and time dependent Schrodinger Wave Equation.
   (b) Write the difference between classical and Qu-bits. [11+4]

2. (a) Explain classical free electron theory.
   (b) Derive expression for the Fermi energy in conductors?
   (c) Discuss the probability of occupation of various energy states by electrons at T = O^0K and T > O^0K on the basis of Fermi factor? [5+5+5]

3. (a) Distinguish between metals, semiconductors and insulators on the basis of band theory of solids.
   (b) Define effective mass of an electron and derive an expression for it.

4. (a) Write the classification of Magnetic Meterial.
   (b) Explain hysteresis loop observed in ferromagnetic materials.
   (c) The area of the hysteresis loop between B and H is 100 m^2. Each unit space along the vertical axis represents 0.001 $Wb/m^2$and each unit space along the horizontal represents 40A/m. Determine the Hysteresis loss per cycle. [6+5+4]

5. (a) What is the Superconductivity? Explain Meissner effect.
   (b) Mention few industrial applications of superconductors.
   (c) Calculate the critical current which can flow through a long thin superconducting wire of aluminium of diameter 10^{-3}m. The critical magnetic field for aluminium is 7.9x10^3amp/m. [6+5+4]

6. (a) Define the following.
   (i)Dielectric strength. (ii)Dielectric loss.(iii)Electric displacement
   (b) What is dielectric Break down? Explain intrinsic break down in dielectric materials.

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(c) Calculate dielectric constant of $BaTiO_3$ crystal of thickness 2 mm which when inserted between two parallel plates of area 10 mm^2 has a capacitance of 1nF. [6+5+4]

7. (a) Derive an expression for the carrier concentration in n-type semiconductor.

   (b) A silicon wafer is doped with 10^{21} phosphorus atoms. Calculate (i)The majority carrier concentration (ii)The minority concentration and (iii)The electrical resistivity of the doped silicon at room temperature of the dopant (iv)atoms; n_i=1.5X10^{16} /m^3, = 0.135m^2/V.s and =0.048 m^2/V.s [9+6]

8. (a) Explain different approaches for the preparation of Nano-Materials.

   (b) What are the various physical, chemical, electrical, optical, mechanical and magnetic properties of nanomaterials [5+10]

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