**Set No. 1**

**Code No: R10203/R10**

**I B.Tech II Semester Regular Examinations, June/July 2011**

# ENGINEERING PHYSICS - II

**(Common to All Branches)**

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

**Answer any FIVE Questions**

**All Questions carry equal marks**

⋆ ⋆ ⋆ ⋆ ⋆

1. (a) Derive the time independent Schrodinger's equation for a free particle.
   (b) Explain the significance of wave function. [ 12M + 3M ]

2. (a) Explain the salient features of Classical free electron theory.
   (b) Derive an expression for the electrical conductivity of a material using classical free electron theory.
   (c) Find the relaxation time of conduction electrons in a metal of resistivity 1.54 x $10^{-8}$ Ω-m, if the metal has 5.8 x $10^{28}$ conduction electrons per $m^3$.
   [3M + 8M + 4M]

3. (a) Discuss the Kronig-Penny model for the motion of an electron in a periodic potential.
   (b) Explain the concept of 'Effective Mass' of an electron.
   [10M + 5M]

4. (a) What is ferromagnetism? Explain the properties of ferromagnetic materials.
   (b) Explain the Hysteresis curve in magnetism on the basis of domains.
   (c) Distinguish between Soft and Hard magnetic materials.
   [5M + 5M + 5M]

5. (a) Discuss the parameters that destruct the Superconductivity.
   (b) Describe the BCS theory of Superconductivity.
   [6M + 9M]

6. (a) Derive expression for internal field seen by an atom in a dielectric material.
   (b) Briefly explain Ferroelectricity and Piezoelectricity.
   [10M + 5M]

7. (a) Derive an expression for the number of electrons per unit volume in the conduction band of an N-type semiconductor.
   (b) Explain the effect of temperature and dopant on Fermi level in N-type semiconductor.
   [10M + 5M]

8. (a) What are Nano materials? Why do they exhibit different properties?
   (b) How are Physical, Chemical and Optical properties of nanoparticles vary with their size?
   [6M + 9M]

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

**I B.Tech II Semester Regular Examinations, June/July 2011**

# ENGINEERING PHYSICS - II

**(Common to All Branches)**

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

**Answer any FIVE Questions**

**All Questions carry equal marks**

⋆ ⋆ ⋆ ⋆ ⋆

1. (a) Show that energies of a particle in a potential box are quantized.
   (b) An electron is confined to a one dimensional potential box of length 2 Å. Calculate the energies corresponding to the second and fourth quantum states in eV.
   [11M + 4M]
2. (a) Explain the salient features of Classical free electron theory.
   (b) On the basis of classical free electron theory, derive the expressions for
   (i) Drift velocity, (ii) current density and (iii) mobility.
   (c) What are the drawbacks of classical free electron theory of metals.
   [3M + 9M + 3M]
3. (a) Discuss the origin of energy bands in solids.
   (b) Explain how the crystalline solids are classified into metals, semiconductors and insulators on the basis of band theory.
   [7M + 8M]
4. (a) Explain the classification of magnetic materials.
   (b) Distinguish between dia, para and ferromagnetic materials.
   (c) A paramagnetic material has a magnetic field intensity of $10^4$ A/m. If the susceptibility of the material at room temperature is $3.7 \times 10^{-3}$, calculate the magnetization and flux density in the material.
   [3M + 8M + 4M]
5. (a) What is Meissner effect? Show that superconductors exhibit perfect diamagnetism.
   (b) Describe Josephson effects.
   (c) Explain the applications of Josephson effect.
   [6M + 6M + 3M]
6. (a) Discuss the frequency dependence of various polarization processes in dielectric materials.
   (b) Derive Clausius-Mosotti equation.
   [9M + 6M]
7. (a) Explain Hall effect. Derive the expression for Hall coefficient of n-type semiconductor.
   (b) Explain the applications of Hall effect.
   [10M + 5M]
8. (a) What are Nano materials? Why do they exhibit different properties?
   (b) How are Physical, Chemical and Optical properties of nanoparticles vary with their size?
   [6M + 9M]

**Set No. 3**

**Code No: R10203/R10**

**I B.Tech II Semester Regular Examinations, June/July 2011**

# ENGINEERING PHYSICS - II

**(Common to All Branches)**

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

**Answer any FIVE Questions**

**All Questions carry equal marks**

⋆ ⋆ ⋆ ⋆ ⋆

1. (a) Derive the time independent Schrodinger's equation for a free particle.
   (b) Explain the significance of wave function.
   [12M + 3M]
2. (a) Explain the Fermi-Dirac distribution function of electrons. Illustrate graphically the effect of temperature on the distribution.
   (b) Discuss the origin of electrical resistance in metals.
   (c) Evaluate the Fermi function for an energy kT above Fermi energy.
   [6M + 6M + 3M]
3. (a) Discuss the origin of energy bands in solids.
   (b) Explain how the crystalline solids are classified into metals, semiconductors and insulators on the basis of band theory.
   [7M + 8M]
4. (a) What is ferromagnetism? Explain the properties of ferromagnetic materials.
   (b) Explain the Hysteresis curve in magnetism on the basis of domains.
   (c) Distinguish between Soft and Hard magnetic materials.
   [5M + 5M + 5M]
5. (a) Explain the critical parameters and their significance in superconductivity.
   (b) Explain Meissner effect. How is it used to classify the superconductors.
   (c) Write the applications of superconductors.
   [6M + 6M + 3M]
6. (a) Discuss the frequency dependence of various polarization processes in dielectric materials.
   (b) Derive Clausius-Mosotti equation.
   [9M + 6M]
7. (a) Derive an expression for the number of electrons per unit volume in the conduction band of an N-type semiconductor.
   (b) Explain the effect of temperature and dopant on Fermi level in N-type semiconductor.
   [10M + 5M]
8. (a) What are Carbon Nanotubes? How are they produced?
   (b) What are the properties of Carbon Nanotubes?
   [10M + 5M]

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

**I B.Tech II Semester Regular Examinations, June/July 2011**

# ENGINEERING PHYSICS - II

**(Common to All Branches)**

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

**Answer any FIVE Questions**

**All Questions carry equal marks**

⋆ ⋆ ⋆ ⋆ ⋆

1. (a) Show that energies of a particle in a potential box are quantized.
   (b) An electron is confined to a one dimensional potential box of length 2 Å. Calculate the energies corresponding to the second and fourth quantum states in eV.
   [11M + 4M]
2. (a) Derive the expression for electrical conductivity on the basis of Quantum free electron theory.
   (b) Explain the Fermi-Dirac distribution function of electrons. Illustrate graphically the effect of temperature on the distribution.
   [9M + 6M]
3. (a) Discuss the Kronig-Penny model for the motion of an electron in a periodic potential.
   (b) Explain the concept of 'Effective Mass' of an electron.
   [10M + 5M]
4. (a) Explain the classification of magnetic materials.
   (b) Distinguish between dia, para and ferromagnetic materials.
   (c) A paramagnetic material has a magnetic field intensity of $10^4$ A/m. If the susceptibility of the material at room temperature is $3.7 \times 10^{-3}$, calculate the magnetization and flux density in the material.
   [3M + 8M + 4M]
5. (a) Explain the critical parameters and their significance in superconductivity.
   (b) Explain Meissner effect. How is it used to classify the superconductors.
   (c) Write the applications of superconductors.
   [6M + 6M + 3M]
6. (a) Derive expression for internal field seen by an atom in a dielectric material.
   (b) Briefly explain Ferroelectricity and Piezoelectricity.
   [10M + 5M]
7. (a) Explain Hall effect. Derive the expression for Hall coefficient of n-type semiconductor.
   (b) Explain the applications of Hall effect.
   [10M + 5M]
8. (a) What are Carbon Nanotubes? How are they produced?
   (b) What are the properties of Carbon Nanotubes?
   [10M + 5M]