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

I B.Tech II Semester Supplementary Examinations, July. 2015
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) Explain the Physical significance of Wave function.
   (b) Derive time dependent Schrodinger wave equation. [7+8]
2. (a) Mention different mechanisms responsible for electrical resistance in metals.
   (b) Find the temperature at which there is 1% probability of a state with an energy 0.5 eV above Fermi energy level will be occupied [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. [8+7]
4. (a) What are the sources of permanent dipole moment of an atom in magnetic materials? Explain.
   (b) What are soft and hard magnetic materials? Give examples. [9+6]
5. (a) Explain the following: (i) Cooper pairs (ii) Flux Quantization.
   (b) Distinguish Type-I and Type-II superconductors. [6+9]
6. (a) What is electronic polarization? Give the expression for electronic polarizability and discuss how does it depend on temperature.
   (b) Mention applications of dielectric materials. [9+6]
7. (a) Derive an expression for the carrier concentration in p-type semiconductor.
   (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) What are the types of Carbon nanotubes? Mention their properties
   (b) How the physical and chemical properties of nano-particles vary with their size? [10+5]

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

I B.Tech II Semester Supplementary Examinations, July. 2015
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) 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.
   (b) Derive schrodinger time independent wave equation for a free particle.
   (c) Calculate the wavelength associated with an electron with energy 2000eV [4+7+4]

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) Derive an Expression for effective mass $(\mathbf{m}^*)$of an electron.
   (b) Distinguish between conductors, semiconductors, and insulators. [9+6]

4. (a) Distinguish between the properties of dia, para and ferro magnetic materials.
   (b) Explain Wiess theory of ferromagnetism.
   (c) What are ferrites? Give two examples. [6+6+3]

5. (a) Define penetration depth. Explain how the penetration depth varies with (i) Temperature (ii) Magnetic field strength.
   (b) Discuss the parameters that destruct superconductivity. [6+9]

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

7. (a) Derive the expression for Fermi level in intrinsic semiconductors.
   (b) Explain different types of semiconductors based on band gap? [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. 3**

I B.Tech II Semester Supplementary Examinations, July. 2015
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) 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) 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) Define the following terms
   (i) Magnetic permeability
   (ii) Magnetic susceptibility
   (iii) Coercivity and
   (iv) retentivity
   (b) Derive the relation between B, H and I
   (c) A magnetic material has intensity of magnetization of 1550 A/m and flux density of 0.0022Wb/m^2. Calculate the magnetizing force and relativity permeability of the material. [8+4+3]

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 = 7.26K. If H_0= 8 x 10^5 A/m find critical magnetic field at 5K. [6+5+4]

6. (a) What is ionic polarizability? Derive an expression for the ionic polarizability. Explain frequency dependence of ionic polarizability.

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(b) If all the molecular dipoles in a 1.0 cm radius water drop are pointed in the same direction, calculate the intensity of polarization. Dipole moment of the water molecule is 6 x 10^{-30} C-m. [9+6]

7. (a) Obtain the equation for the conductivity of an intrinsic semiconductor in terms of carrier concentration and carrier mobility.
   (b) Write notes on direct band gap and indirect band gap semiconductors. [7+8]

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**

I B.Tech II Semester Supplementary Examinations, July. 2015
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) Define classical bit and qu bit. Explain the differences between classical bit and qu bit.
   (b) What are quantum gates. Explain with examples. [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) 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. [8+7]
4. (a) Explain classification of magnetic materials.
   (b) Derive the expression $\mu_r = 1+\chi$ [10+5]
5. (a) Explain the critical parameters and their significance in superconductors.
   (b) Explain the 'Magnetic levitation' and' Fast electrical switching' applications of super conductors. [11+ 4]
6. (a) Show that electronic polarizabity is directly proportional to volume of the atom.
   (b) What are the chief characteristics of Ferro electric materials? How the dielectric constant of a ferroelectric crystal does vary with temperature? [7+8]
7. (a) Explain the mechanism of current conduction in n and p type semiconductors.
   (b) Explain the effect of temperature and doping concentration on the Fermi level in a n-type semiconductor. [8+7]
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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