

Code No: R10203/R10

Set No. 1

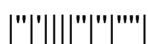
I B.Tech II Semester Supplementary Examinations, July. 2015
ENGINEERING PHYSICS -II
 (Common to Civil Engineering, Electrical & Electronics Engineering,
 Mechanical Engineering, Electronics & Communication Engineering,
 Computer Science & Engineering, Chemical Engineering, Electronics &
 Instrumentation Engineering, Bio-Medical Engineering, Information
 Technology, Electronics & Computer Engineering, Aeronautical
 Engineering, Bio-Technology, Automobile Engineering, Mining and
 Petroleum Technology)

Time: 3 hours

Max Marks: 75

Answer any FIVE Questions
All Questions carry equal marks

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°C and 227°C. given $E_g=1.1\text{eV}$ and $K=1.38 \times 10^{-23} \text{ J/k}$. [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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Time: 3 hours

Max Marks: 75

Answer any FIVE Questions
All Questions carry equal marks

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 (m^*) of an electron.
 (b) Distinguish between conductors, semiconductors, and insulators. [9+6]

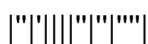
4. (a) Distinguish between the properties of dia, para and ferro magnetic materials.
 (b) Explain Wiess theory of ferromagnetism.
 (c) What are ferrites? Give two examples. [6+6+3]

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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Time: 3 hours

Max Marks: 75

Answer any FIVE Questions
All Questions carry equal marks

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 $T = 0^{\circ}\text{K}$ and $T > 0^{\circ}\text{K}$ 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” (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 $T_c = 7.26\text{K}$. If $H_0 = 8 \times 10^5 \text{ A/m}$ 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 6×10^{-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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Time: 3 hours

Max Marks: 75

Answer any FIVE Questions
All Questions carry equal marks

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 polarizability 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]

