Subject Code-: R10203/R10 **Set No - 1**

I B.Tech II Semester Regular Examinations June - 2012

ENGINEERING PHYSICS - II

(Common to All Branches)

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

Answer any FIVE Questions
All Questions carry equal marks

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1.(a) Derive time independent Schrodinger wave equation for a free particle.
(b) An electron in an infinite potential well has an energy of 5 eV in the n=4 level. What is the width of the well?

[11M + 4M]

2.(a) Derive the expression for electrical conductivity of a metal on the basis of classical free electron theory. How is it affected by temperature?
(b) Discuss the various drawbacks of classical free electron theory of metals and explain the assumptions made in quantum theory to overcome the drawbacks.

[12M + 3M]

3.(a) Explain Bloch theorem.
(b) Give an account of Band theory of solids based on the Kronig-Penny model. Discuss the salient features of Kronig-Penny model of a crystal.

[3M + 12M]

4.(a) Define the terms 'magnetic susceptibility' and 'magnetic induction'.
(b) What are the sources of permanent dipole moment in magnetic materials?
(c) Distinguish between dia, para and ferro magnetic materials.

[4M + 5M + 6M]

5.(a) Describe the BCS theory of superconductivity.
(b) Describe the phenomenon of flux quantization.

[10M + 5M]

6.(a) Explain the electronic polarisability in atoms and obtain an expression for electronic polarisability in terms of the radius of the atom.
(b) Derive Clausius-Mosotti equation.

[9M + 6M]

7.(a) State and explain Hall effect.
(b) Derive expression for Hall coefficient.
(c) The R_H of a specimen is $3.66 \times 10^{-4}\ m^3\ c^{-1}$. Its resistivity is $8.93 \times 10^{-3} \Omega m$. Find mobility and charge carrier concentration.

[3M + 8M + 4M]

8.(a) Discuss the physical and chemical properties of Nano materials.
(b) Analyse the applications of Nanotechnology in different fields.

[8M + 7M]

Subject Code-: R10203/R10 **Set No - 2**

I B.Tech II Semester Regular Examinations June - 2012

ENGINEERING PHYSICS - II

(Common to All Branches)

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

Answer any FIVE Questions
All Questions carry equal marks

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1.(a) Solve the Schrodinger wave equation for a particle confined in a three dimensional cubic potential of width 'L' and infinite height. Obtain an expression for its energy and wave function.
(b) An electron in an infinite potential well has an energy of 5 eV in the n=4 level. What is the width of the well?
[11M + 4M]

2.(a) What are the important features of the free electron gas model?
(b) What are the main sources of electrical resistance in a metal? How does the conductivity of a metal vary with rise of temperature and added impurity content?
[8M + 7M]

3.(a) Explain the origin of energy bands in solids.
(b) Derive an expression for the effective mass of an electron moving in energy bands of a solid. Show how it varies with the wave vector.
(c) Calculate the velocity and kinetic energy of an electron of wavelength 1.66×10^{-10}m.
[5M + 6M + 4M]

4.(a) Explain ferromagnetism.
(b) Explain the Hysteresis of ferromagnetic materials. How is it used to classify magnets?
[5M + 10M]

5.(a) What is superconductivity? Explain critical parameters and their significance in superconductors.
(b) Describe Josephson Effect and its applications.
[7M + 8M]

6.(a) Explain the electronic polarisability in atoms and obtain an expression for electronic polarisability in terms of the radius of the atom.
(b) Derive Clausius-Mosotti equation.
[9M + 6M]

7.(a) What do you understand by drift and diffusion currents in the case of a semiconductor? Deduce Einstein's relation relating to these currents.
(b) Explain Hall Effect and its applications.
[10M + 5M]

8.(a) What are nano materials? Why do they exhibit different properties?
(b) Write the important applications of nano materials.
[9M + 6M]

Subject Code-: R10203/R10 **Set No - 3**

I B.Tech II Semester Regular Examinations June - 2012

ENGINEERING PHYSICS - II

(Common to All Branches)

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

Answer any FIVE Questions
All Questions carry equal marks

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1.(a) Derive time independent Schrodinger wave equation for a free particle.
(b) The ground state energy of an electron in an infinite potential well is 20 eV. What is the energy of the first excited level? What is the length of the well?
[11M + 4M]

2.(a) Write short notes on relaxation time, mean free path and drift velocity.
(b) Show that the resistivity of a metal above room temperature varies directly with temperature.
(c) Find the relaxation time of conduction electrons in a metal of resistivity 1.54×10^{-8} Ω-m, if the metal has 5.8×10^{28} conduction electrons per m^3.
[6M + 5M + 4M]

3.(a) Describe with essential picturisation, potential encountered by an electron in a crystal and hence the origin for band spectrum.
(b) Distinguish between conductors, semiconductors and insulators.
[9M + 6M]

4.(a) Define the terms 'magnetic susceptibility' and 'magnetic induction'.
(b) What are the sources of permanent dipole moment in magnetic materials?
(c) Distinguish between dia, para and ferro magnetic materials.
[4M + 5M + 6M]

5.(a) What is Superconductivity? Explain the properties of a superconductor in detail.
(b) How are superconductors classified? Explain their properties.
[8M + 7M]

6.(a) Explain the origin of different kinds of Polarisation in dielectric materials.
(b) Obtain an expression for Electronic polarisability in terms of the radius of the atom.
[8M + 7M]

7.(a) State and explain Hall effect.
(b) Derive expression for Hall coefficient.
(c) The R_H of a specimen is 3.66×10^{-4} m^3 c^{-1}. Its resistivity is 8.93×10^{-3}Ωm. Find mobility and charge carrier concentration.
[3M + 8M + 4M]

8.(a) What are nano materials? Why do they exhibit different properties?
(b) Write the important applications of nano materials.
[9M + 6M]

Subject Code-: R10203/R10 **Set No - 4**

I B.Tech II Semester Regular Examinations June - 2012

ENGINEERING PHYSICS - II

(Common to All Branches)

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

Answer any FIVE Questions
All Questions carry equal marks

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1.(a) Solve the Schrodinger wave equation for a particle confined in a three dimensional cubic potential of width 'L' and infinite height. Obtain an expression for its energy and wave function.
(b) The ground state energy of an electron in an infinite potential well is 20 eV. What is the energy of the first excited level? What is the length of the well?
[11M + 4M]

2.(a) What is Fermi level?
(b) Explain the Fermi-Dirac distribution function of electrons. Explain the effect of temperature on the distribution.
(c) What are the main sources of electrical resistance in a metal? How does the conductivity of a metal vary with rise of temperature and added impurity content?
[2M + 6M + 7M]

3.(a) Explain Bloch theorem.
(b) Give an account of Band theory of solids based on the Kronig-Penny model. Discuss the salient features of Kronig-Penny model of a crystal.
[3M + 12M]

4.(a) Explain ferromagnetism.
(b) Explain the Hysteresis of ferromagnetic materials. How is it used to classify magnets?
[5M + 10M]

5.(a) What is superconductivity? Explain critical parameters and their significance in superconductors.
(b) Describe Josephson effect and its applications.
[7M + 8M]

6.(a) Explain the origin of different kinds of Polarisation in dielectric materials.
(b) Obtain an expression for Electronic polarisability in terms of the radius of the atom.
[8M + 7M]

7.(a) What do you understand by drift and diffusion currents in the case of a semiconductor? Deduce Einstein's relation relating to these currents.
(b) Explain Hall Effect and its applications.
[10M + 5M]

8.(a) Discuss the physical and chemical properties of Nano materials.
(b) Analyse the applications of Nanotechnology in different fields.
[8M + 7M]