Subject Code: R13103/R13 **Set No - 1**

I B. Tech I Semester Regular Examinations Jan./Feb. - 2015

ENGINEERING PHYSICS

(Common to ECE, EEE, EIE, Bio-Tech, EComE, Agri.E)

Time: 3 hours **Max. Marks: 70**

Question Paper Consists of **Part-A** and **Part-B**
Answering the question in **Part-A** is Compulsory,
Three Questions should be answered from **Part-B**

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PART-A

1.(i) Account for the circular shape of 'Newton's rings in interference pattern.
(ii) Draw (1 1 1) and (1 1 0) planes in a cubic lattice.
(iii) Distinguish between Soft and Hard magnetic materials.
(iv) What are the fundamental laws of electromagnetism?
(v) Calculate the wavelength associated with an electron raised to a potential 1600V.
(vi) Describe the working mechanism for of Light Emitting Diode.

[3+4+4+4+3+4]

PART-B

2.(a) What are the types of diffraction and give the differences between them.
(b) Write notes on Rayleigh's Criterion.
(c) Define Resolving power of a grating. Derive the expression for Resolving power of a grating based on Rayleigh's Criterion.

[4+6+6]

3.(a) What are Miller Indices? How are they obtained?
(b) State and prove Bragg's law of X-ray diffraction. What is the limiting condition for Bragg's law?
(c) The Bragg's angle for reflection from the (1 1 1) plane in FCC crystal is 19.2^{o} for an X-ray wavelength of 1.54Å. Compute the cube edge of the unit cell.

[6+6+4]

4.(a) Derive London equations pertaining to superconductors.
(b) Write notes on penetration depth in superconductivity.
(c) What are applications of superconductors?

[6+6+4]

5.(a) Mention the basic requirements of an acoustically good hall.
(b) Write notes on Absorption coefficient and its measurement.

[8+8]

6.(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.

[4+12]

7.(a) Write the expressions for electron and hole concentrations in an intrinsic semiconductor and hence derive the expression for Fermi energy in an intrinsic semiconductor.
(b) How does the electrical conductivity vary with temperature for an intrinsic semiconductor?
(c) If the effective mass of electron is equal to twice the effective mass of hole, determine the position of the Fermi level in an intrinsic semiconductor from the centre of forbidden gap at room temperature.

[6+6+4]

Subject Code: R13103/R13 **Set No - 2**

I B. Tech I Semester Regular Examinations Jan./Feb. - 2015

ENGINEERING PHYSICS

(Common to ECE, EEE, EIE, Bio-Tech, EComE, Agri.E)

Time: 3 hours **Max. Marks: 70**

Question Paper Consists of **Part-A** and **Part-B**
Answering the question in **Part-A** is Compulsory,
Three Questions should be answered from **Part-B**

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PART-A

1.(i) Explain the colours in a thin film when exposed to sunlight.
(ii) Define Coordination Number, Nearest Neighbor Distance and Atomic Radius.
(iii) Explain Diamagnetism. Why diamagnetic materials have negative susceptibility?
(iv) A hall has dimensions 20x15x5 m^3. The reverberation time is 3.5 sec. Calculate the total absorption of its surfaces.
(v) What are Matter waves? Derive the expression for their wavelength.
(vi) Describe the working mechanism for Photo conductors.

[4+3+4+3+4+4]

PART-B

2.(a) Describe Frunhofer diffraction due to 'n' parallel slits.
(b) Describe the action of plane transmission grating in producing diffraction spectrum.
(c) Show that the grating with 500 lines/cm cannot give a spectrum in the 4^{th} order for the light of wavelength 5890Å.

[6+6+4]

3.(a) What is meant by population of an energy state?
(b) What is Population inversion? How is it achieved? Why is it necessary for lasing action?
(c) With neat diagram, describe the construction and working of Ruby laser.

[2+8+6]

4.(a) Explain electronic polarisability and show that electronic polarisability for a mono atomic gas increases as the size of the atom becomes larger.
(b) The dielectric constant of He gas at NTP is 1.0000684. Calculate the electronic polarisability of He atoms if the gas contains $2.7x10^{25}$ atoms per m^3.

[12+4]

5.(a) Explain the terms 'Reverberation time' and 'Absorption Coefficient'.
(b) Derive Sabine's formula for reverberation time.

[4+12]

6.(a) What is Fermi level?
(b) Explain the Fermi-Dirac distribution function of electrons. Explain the effect of temperature on the distribution.
(c) Explain the concept of effective mass of an electron.

[2+8+6]

7.(a) State and explain Hall effect.
(b) Show that for n-type semiconductor the Hall coefficient $R_H = -\frac{1}{n_e}$.
(c) Write any four applications of Hall effect.

[6+6+4]

Subject Code: R13103/R13 **Set No - 3**

I B. Tech I Semester Regular Examinations Jan./Feb. - 2015

ENGINEERING PHYSICS

(Common to ECE, EEE, EIE, Bio-Tech, EComE, Agri.E)

Time: 3 hours **Max. Marks: 70**

Question Paper Consists of **Part-A** and **Part-B**
Answering the question in **Part-A** is Compulsory,
Three Questions should be answered from **Part-B**

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PART-A

1.(i) How diffraction is different from interference?
(ii) Obtain the relation between the edge of the unit cell and atomic radius for SC, BCC and FCC lattices.
(iii) Explain the properties of ferromagnetic materials.
(iv) What are the fundamental laws of electromagnetism?
(v) Show that the wavelength associated with an electron of mass 'm' and kinetic energy É' is given by $\lambda=\frac{h}{\sqrt{2mE}}$.
(vi) Describe the working mechanism for of Light Emitting Diode.

[4+3+4+4+3+4]

PART-B

2.(a) Explain the concept of coherence and discuss why two different sources of light of the same wavelength cannot produce interference fringes.
(b) Obtain an expression for the diameter of the n^{th} dark ring in the case of Newton's rings.
(c) Two coherent sources produce interference pattern. Intensity ratio of bright fringe to dark fringe is 9:1. Calculate the intensity ratio of the sources.

[6+6+4]

3.(a) What are the characteristics of laser beam? Explain.
(b) Distinguish between Spontaneous and Stimulated emissions.
(c) Derive the expression for energy density of radiation in terms of Einstein coefficients.

[4+4+8]

4.(a) What is superconductivity? Explain Meissner effect. Describe type-I and type-II superconductors.
(b) Describe Josephson effects. Explain the applications of Josephson effect.

[8+8]

5.(a) Mention the basic requirements of an acoustically good hall.
(b) Write notes on Absorption coefficient and its measurement.

[8+8]

6.(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.

[4+12]

7.(a) Write the expressions for electron and hole concentrations in an intrinsic semiconductor and hence derive the expression for Fermi energy in an intrinsic semiconductor.
(b) How does the electrical conductivity vary with temperature for an intrinsic semiconductor?
(c) If the effective mass of electron is equal to twice the effective mass of hole, determine the position of the Fermi level in an intrinsic semiconductor from the centre of forbidden gap at room temperature.

[6+6+4]

Subject Code: R13103/R13 **Set No - 4**

I B. Tech I Semester Regular Examinations Jan./Feb. - 2015

ENGINEERING PHYSICS

(Common to ECE, EEE, EIE, Bio-Tech, EComE, Agri.E)

Time: 3 hours **Max. Marks: 70**

Question Paper Consists of **Part-A** and **Part-B**
Answering the question in **Part-A** is Compulsory,
Three Questions should be answered from **Part-B**

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PART-A

1.(i) What is Brewster's law? Prove that the angle between reflected and refracted beams is 90^0, if the angle incidence corresponds to Brewster's angle.
(ii) What are the important features of Miller indices?
(iii) What are the sources of permanent dipole moment in magnetic materials?
(iv) A hall has dimensions 20x15x5 m^3. The reverberation time is 3.5 sec. Calculate the total absorption of its surfaces.
(v) What are Matter waves? Explain their properties.
(vi) Describe the working mechanism for solar cells.

[4+4+3+3+4+4]

PART-B

2.(a) What are the necessary conditions for obtaining interference fringes?
(b) With ray diagram discuss the theory of thin films and derive the condition for constructive and destructive interference in the case of reflected system.
(c) A parallel beam of light λ=5890Å, is incident on a glass plate (μ=1.5) such that angle of refraction into plate is 60^o. Calculate the smallest thickness of the plate which will make it appear dark by reflection.

[3+9+4]

3.(a) What is Optical fiber? What are the conditions to produce total internal reflection in optical fiber.
(b) Describe acceptance angle of an optical fibre and derive an expression for it.
(c) Calculate the angle of acceptance of a given optical fiber, if the refraction indices of the core and the cladding are 1.563 and 1.498 respectively.

[4+8+4]

4.(a) What are super conductors? Explain BCS theory.
(b) Derive London's equations and also derive the expression for London penetration depth.

[8+8]

5.(a) Explain the terms 'Reverberation time' and 'Absorption Coefficient'.
(b) Derive Sabine's formula for reverberation time.

[4+12]

6.(a) What is Fermi level?
(b) Explain the Fermi-Dirac distribution function of electrons. Explain the effect of temperature on the distribution.
(c) Explain the concept of effective mass of an electron.

[2+8+6]

7.(a) State and explain Hall effect.
(b) Show that for n-type semiconductor the Hall coefficient $R_H = -\frac{1}{n_e}$.
(c) Write any four applications of Hall effect.

[6+6+4]