FACULTY OF ENGINEERING & INFORMATICS

B.E. I-Year (common to all) (Main) Examination, June 2011

Subject: Engineering Physics

Time : 3 Hours Max. Marks: 75

Note: Answer all questions of Part-A and answer any five questions from Part-B.

Part-A (25 marks)

1. A soap film (n=1.33) in air is 320 nm thick. If it is illuminated with white light at normal incidence, what color will appear to be in reflected light? [June 2011, 3 marks]
2. Two Nicols have parallel polarizing directions so that the intensity of transmitted light is maximum. Trough what angle must either Nicol be turned if intensity is to drop by one-fourth of its maximum value? [June 2011, 2 marks]
3. Compare and contrast between Bose-Einstein and Fermi-Dirac statistics. [June 2011, 3 marks]
4. Calculate the value of pointing vector at the surface of the sun if the power radiated by the sun is 3.8×10^{26} W and its radius is 7×10^{8} m. [June 2011, 2 marks]
5. The first order diffraction is found to occur at a glancing angle of 9^0. Calculate the wavelength of X-rays and the glancing angle of second order diffraction if the spacing between the adjacent planes is 2.51 A^0. [June 2011, 3 marks]
6. For an intrinsic semiconductor having band gap E_g= 0.7eV, calculate the density of holes and electrons at room temperature (27 ^{0}C). Given K=1.38×10^{-23} J/K and h=6.62×10^{-34} J. [June 2011, 3 marks]
7. Draw the nature of magnetic dipole moments and variation of susceptibility with temperature graphs in ferro, ferri-and anti-ferromagnetic materials. [June 2011, 3 marks]
8. Explain the isotopic effect in superconductors. [June 2011, 2 marks]
9. Write few applications of nano materials. [June 2011, 2 marks]
10. Explain how X-diffraction is used in characterizing the nano materials. [June 2011, 2 marks]

Part-B (50 marks)

11. A) Obtain an expression for the intensity of diffraction pattern in case of Fraunhofer diffraction at single slit, and obtain the condition for minima of different orders. [June 2011, 8 marks]
    B) Explain the construction of quarter wave plate. [June 2011, 2 marks]
12. A) Discuss the properties of wave function. [June 2011, 2 marks]
    B) Using Schrodinger time independent wave equation, discuss the nature of a particle moving across the potential barrier and define quantum tunneling. [June 2011, 8 marks]
13. A) Discuss the free electron theory of metals. [June 2011, 5 marks]
    B) Explain, how Kronig-Penny model of solids lead to energy band formation. [June 2011, 5 marks]
14. A) Explain the phenomenon of ferroelectricity and discuss how dielectric constant of Barium titanate changes as its temperature is decreased. [June 2011, 7 marks]
    B) Write few applications of ferroelectrics. [June 2011, 3 marks]
15. A) What are thin films? Describe the chemical vapour deposition method of preparation of thin films. [June 2011, 5 marks]
    B) Write notes on solar-cells. [June 2011, 5 marks]
16. A) Explain the construction and working of Ruby-laser. [June 2011, 5 marks]
    B) Using Bose-Einstein distribution law obtain the Planck's law of black body radiation. [June 2011, 5 marks]
17. Write a note on:
    A) Concept of Fermi level in semiconductors. [June 2011, 2 marks]
    B) Type I and Type II superconductors. [June 2011, 4 marks]
    C) TEM [June 2011, 4 marks]

FACULTY OF ENGINEERING & INFORMATICS

B.E. I-Year (common to all) (Supplementary) Examination, Jan 2012

Subject: Engineering Physics

Time : 3 Hours Max. Marks: 75

Note: Answer all questions of Part-A and answer any five questions from Part-B.

Part-A (25 marks)

1. How many orders will be observed by a grating having 4000 lines per cm if it is illuminated by visible light in the range 4000 A^0 and 7000 A^0? [Jan 2012, 3 marks]
2. Match the following :

1. The innermost part of optical fibre	a. R.I of core increases towards the axis of the core
2. In Graded index fibre	b. Interference
3. Laser beam is made of	c. Core
4. Hologram is related to	d. Highly coherent photons
	e. electrons
	f. Non-Uniform refractive index. [Jan 2012, 2 marks]

3. The energy of an electron contained to move in a one-dimensional box of length 4.0 A^0 is 9.664 X 10^{-17} J. Find out the order of excited state. [Jan 2012, 2 marks]
4. What is displacement current? Explain. [Jan 2012, 2 marks]
5. i) The Miller indices of a set of parallel planes which make equal intercepts on three axes are
   a) (1 2 1) b) (1 1 1) c) (1 0 0) d) (1 0 1) [Jan 2012, 1 marks]
   ii) In a simple cubic lattice the ratio of $d_{100} : d_{110} : d_{111}$ is
   a) $\sqrt{6} : \sqrt{3} : \sqrt{2}$ b) $\sqrt{3} : \sqrt{6} : \sqrt{1}$ c) $6 : \sqrt{3} : \sqrt{2}$ d) $6 : 3 : 1$ [Jan 2012, 2 marks]
6. Mobilities of electrons and holes in a sample of intrinsic Ge at 300 K are 0.36 $m^2V^{-1}S^{-1}$ and 0.17 $m^2V^{-1}S^{-1}$ respectively. If the resistivity of the specimen is 2.12 ohm –m, compute the intrinsic concentration of carriers for Ge. Where $m_e^*=0.5\ m_0$ and $m_h^*=0.37\ m_0$. [Jan 2012, 3 marks]
7. Draw the crystal structure of Barium titanate above 393 K and explain how its structure and polarization changes with decreasing temperature. [Jan 2012, 3 marks]
8. Define the terms critical temperature, critical magnetic field and critical current. [Jan 2012, 3 marks]
9. What are carbon nano tubes? Explain. [Jan 2012, 2 marks]
10. Explain the basic principle used in atomic force microscopes. [Jan 2012, 2 marks]

Part –B (50 marks)

11. What is optical activity? Explain construction and working of Laurent's half shade polarimeter. [Jan 2012, 10 marks]
12. a) Explain what is phase-space. [Jan 2012, 2 marks]
    b) Distinguish between Bosons and Fermions. Obtain the expression for Fermi-Dirac distribution law. [Jan 2012, 2+6 marks]
13. a) Show that among S.C, B.C.C, and FCC, FCC has closed packed structure. [Jan 2012, 5 marks]
    b) Obtain an expression for the concentration of Schottkey defects in ionic crystals. [Jan 2012, 5 marks]
14. a) What are dielectrics? Explain various electrical polarization mechanisms. [Jan 2012, 6 marks]
    b) Distinguish between soft and hard magnetic materials. [Jan 2012, 4 marks]
15. a) Distinguish between bulk, thin film and nano-scale materials. [Jan 2012, 3 marks]
    b) Explain the thermal evaporation method of depositing thin films. [Jan 2012, 7 marks]
16. a) Describe the classification of optical fibers. [Jan 2012, 4 marks]
    b) Write down the Maxwell's equation and deduce an expression for the velocity of propagation of a plane electromagnetic wave in homogeneous, isotropic dielectric medium. [Jan 2012, 6 marks]
17. Write a note on :
    a) LED [Jan 2012, 5 marks]
    b) High temperature superconductors. [Jan 2012, 5 marks]

FACULTY OF ENGINEERING & INFORMATICS

B.E. I-Year (common to all) (Main) Examination, June 2012

Subject: Engineering Physics

Time : 3 Hours Max. Marks: 75

Note: Answer all questions of Part-A and answer any five questions from Part-B.

Part-A (25 marks)

1. Newton's rings formed by sodium light between glass plate and a convex lens are viewed normally. Find the order of the dark ring which will have double the diameter of that of 30th ring. [June 2012, 2 marks]
2. Calculate the minimum number of lines per cm in a 2.5 cm wide grating which will just resolve the sodium lines (5890 A^0 and 5896 A^0) in the first order spectrum. [June 2012, 2 marks]
3. Obtain Rayleigh Jeans law and Wien's law from Planck's law. [June 2012, 3 marks]
4. Explain the types of point defects observed in crystals. [June 2012, 3 marks]
5. What do you understand by quantum tunneling? [June 2012, 3 marks]
6. State and explain Bragg's law in X-ray diffraction. [June 2012, 3 marks]
7. Explain the concept of spontaneous polarization in feffoelctrics. [June 2012, 3 marks]
8. Distinguish between type I and type II superconductors [June 2012, 2 marks]
9. Explain the principle of Auger process. [June 2012, 2 marks]
10. Match the following [June 2012, 2 marks]

i.	Pulsed laser	a. Kronig-Penny model
ii.	BCS theory	b .Bose-Einstein statistics
iii.	Photon gas	c. He-Ne laser
iv.	Band theory	d. superconductivity
v.		e. Ruby Laser.

Part-B (50 marks)

11. a) Describe Newton's rings experiment to determine the wavelength of a monochromatic source with a neat diagram. [June 2012, 5 marks]
    b) Explain the theory of Fraunhoffer diffraction due to single slit quantitatively [June 2012, 5 marks]
12. a) Describe the working of Ruby laser with suitable energy level diagram [June 2012, 5 marks]
    b) Describe the infinite square well potential problem using wave mechanics. [June 2012, 5 marks]
13. a) Derive Maxwell-Boltzmann distribution law and explain limitations. [June 2012, 5 marks]
    b) State and explain Maxwell's equations in differential form. [June 2012, 5 marks]
14. a) Describe the powder diffraction method for the determination of lattice constant of a cubic unit cell. [June 2012, 5 marks]
    b) What is Hall Effect? Deduce the expression for Hall coefficient in case of a semiconductor. [June 2012, 5 marks]
15. a) Derive the expression for electronic Polarizability in case of dielectrics. [June 2012, 5 marks]
    b) Describe Weiss molecular field theory of Ferromagnetism. [June 2012, 5 marks]
16. a) Explain in detail thermal evaporation technique to prepare a thin film [June 2012, 7 marks]
    b) Explain the ball milling method of preparing nano-materials. [June 2012, 3 marks]
17. Write any two short note of the following: [June 2012, 10 marks]
    i. Photon gas
    ii. Kronig-Penny model
    iii. Thermistor.

FACULTY OF ENGINEERING & INFORMATICS

B.E. I-Year (common to all) (Supplementary) Examination, Jan- 2013

Subject: Engineering Physics

Time : 3 Hours Max. Marks: 75

Note: Answer all questions of Part-A and answer any five questions from Part-B.

Part-A (25 marks)

1. Define the phenomenon of 'Optical activity'. [Jan 2013, 2 marks]
2. How many orders will be visible if the wavelength of the incident radiation deviated at an angle of 30^0 is 5893 A^0 and the number of lines on the grating is 2540 per inch? [Jan 2013, 3 marks]
3. Distinguish between M.B, B.E and F.D distribution. [Jan 2013, 2 marks]
4. Explain the concept of quantum tunneling. [Jan 2013, 3 marks]
5. Classify the solids into conductors, insulators and semiconductors on the basis of band theory of solids. [Jan 2013, 2 marks]
6. Explain the nature of conductivity in intrinsic semiconductors. [Jan 2013, 3 marks]
7. Distinguish between ferro, antiferro and ferri magnetic materials. [Jan 2013, 2 marks]
8. The superconducting transition temperature of a metal is 7.26K. The critical field at 0 K is 64 X 10^3 A/m. Calculate the critical fluid at 5K. [Jan 2013, 3 marks]
9. Explain the principle of X-ray fluorescene. [Jan 2013, 2 marks]
10. What are carbon nanotubes? Explain their applications. [Jan 2013, 3 marks]

Part-B (50 marks)

11. i. Derive the expression for wavelength of incident light by forming Newton's rings taking diameters of rings into account. [Jan 2013, 5 marks]
    ii. Explain the construction and working of Nicol's prism. What is the limitation for use of Nicol's prism. [Jan 2013, 5 marks]
12. i. Apply the Schrodinger time independent wave equation to a particle in an infinite square well potential and calculate its eigen values. [Jan 2013, 5 marks]
    ii. What is pointing vector and derive the expression for it by using Maxwell's EM wave equations? [Jan 2013, 5 marks]
13. i. Define the terms space lattice and unit cell. Explain the crystal systems and corresponding Bravais lattices. [Jan 2013, 6 marks]
    ii. Write a short note on point defects in solids. [Jan 2013, 4 marks]
14. i. What is thin film and explain the thermal evaporation method for preparation of thin film? [Jan 2013, 6 marks]
    ii. Explain the principle of Auger electron process. [Jan 2013, 4 marks]
15. i. Explain the experimental method of Schering Bridge for determination of dielectric constant. [Jan 2013, 5 marks]
    ii. What is superconductivity? Explain the general properties of superconductors. [Jan 2013, 5 marks]
16. i. Explain the Weiss molecular field theory of ferro magnetism and obtain the Curie-Weiss law. [Jan 2013, 5 marks]
    ii. Describe the construction and working of Ruby laser. [Jan 2013, 5 marks]
17. i. Write the Maxwell's equations in integral and differential forms. [Jan 2013, 4 marks]
    ii. Derive an expression for the equilibrium concentration of Frenkel defects in crystals. [Jan 2013, 6 marks]

FACULTY OF ENGINEERING & INFORMATICS

B.E. I-Year (common to all) (Supplementary) Examination, June 2013

Subject: Engineering Physics

Time : 3 Hours Max. Marks: 75

Note: Answer all questions of Part-A and answer any five questions from Part-B.

Part-A (25 marks)

1. What are the basic principles of Holography? (2)
2. If diameters of two consecutive Newton's rings in reflected light of wavelength 5890A^o are 2.0 and 2.02 cm respectively, calculate the radius of curvature of the lens. (2)
3. Obtain Rayleigh-Jeans law and Wein's law from Planck's law (2)
4. Define pointing vector (2)
5. Calculate the packing fraction for SC, BCC and FCC crystals (3)
6. The intrinsic carrier density at 300 K in silicon is 1.62 X 10^{16} /m^3. If the electron and hole Mobilities are 0.13 and 0.06 $m^2V^{-1}S^{-1}$ respectively. Calculate the conductivity of intrinsic silicon. (3)
7. Distinguish hard and soft magnetic materials (2)
8. Distinction between bulk, thin films and nano materials (3)
9. What are type II superconductors? Explain their importance. (3)
10. What is sputtering? Explain the advantages of sputtering deposition. (3)

Part-B (50 marks)

11. (a) Describe Fraunhofer diffraction of light due to single slit and explain maxima and minima conditions and derive the expression for resultant intensity. (6)
11. (b) Explain the working of He-Ne laser with the help of neat diagram by giving energy level transitions. (4)
12. (a) Derive the expression for Planck's law of radiation by considering the Bose-Einstein distribution function. (5)
12. (b) Derive an expression for the velocity of propagation of a plane e.m. wave in homogeneous, isotropic dielectric medium by using Maxwell's equations. (6)
13. (a) Explain the salient features of Kronig-Penny model and its conclusions for formation of energy bands in solids (6)
13. (b) State and explain Miller Indices (4)
14. (a) What are dielectrics? Explain different types of electric polarization mechanisms contributing to the total polarization of dielectric materials. (6)
14. (b) What is superconductivity? Describe the preparation of High T_c superconductors.(4)
15. (a) Explain the construction and working of TEM transmission electron microscope. (6)
15. (b) Describe the chemical vapour deposition (CVD) method for preparation of thin films(4)
16. (a) Explain the preparation of nano materials by sol-gel method (5)
16. (b) What is the principle of X-ray fluorescence and mention its applications (5)
17. (a) Describe the powder diffraction experimental method for determination of "inter-planar spacing "of a crystal. (5)
17. (b) What are ferrites? Explain its spinal and inverse spinal structure. (5)

FACULTY OF ENGINEERING & INFORMATICS

B.E. I-Year (common to all) (Supplementary) Examination, December 2013

Subject: Engineering Physics

Time : 3 Hours Max. Marks: 75

Note: Answer all questions of Part-A and answer any five questions from Part-B.

Part-A (25 marks)

1. What do you understand by division of wavefront and division of amplitude? (3)
2. Determine the specific rotation of the sugar solution, if the plane of polarization is turned through 15^{o}. The length of the tube containing 20% of sugar is 20cm. (2)
3. Obtain Rayleigh Jeans law and Wien's law from Planck's law (3)
4. Explain the significance of wave function in wave mechanics (2)
5. Calculate the packing fraction of BCC and FCC lattices. (3)
6. Distinguish between intrinsic and extrinsic semiconductors (3)
7. Distinguish between Ferrimagnetism and Anti Ferromagnetism. (2)
8. What are the applications of superconductors in Engineering? (3)
9. Explain the characteristics of carbon nanotubes. (2)
10. Match the following (2)

(i) Ball Milling	(a) Kronig-Penney model
(ii) BCS theory	(b) Maxwell-Boltzmann statistics
(iii) Electron gas	(c) Fermi-Dirac statistics
(iv) Band theory	(d) Superconductivity
	(e) Nano materials

1. i(a), ii(d), iii(c), iv(e) 2. i(a), ii(b), iii(c), iv(d)
3. i(b), ii(a), iii(c), iv(e) 4. i(e), ii(d), iii(c), iv(a)

Part-B (5 x 10=50 marks)

11. (a) Describe the necessary theory of interference in thin films by reflected light. (5)
(b) Explain the experiment to determine the wavelength of a monochromatic light using diffraction grating. (5)
12. (a) Describe the working of a He-Ne laser with suitable energy level diagram. (5)
(b) Explain the propagation of a signal in step index and graded index fibers (5)
13. (a) Derive Bose-Einstein distribution law and explain the limitations (5)
(b) Explain the classification of ensembles in statistical mechanics (5)
14. (a) Derive the expression for the concentration of Schottky defects in ionic crystals (5)
(b) Describe the construction and working of LED. (5)
15.a)Describe the technique to determine the dielectric constant of given dielectric material (5)
(b)Using domain theory of magnetism,explain various stages in the study of Hysteresis curve(5)
16. (a) Explain in detail the preparation of a nano material using sol-gel method. (5)
(b) Describe the working of a thin film solar cell. (5)
17. Write short notes on any two of the following. (10)
(a) X-ray fluorescence
(b) Free electron theory
(c) High T_c superconductors