Code No: R05010103 **Set No. 1**

I B.Tech Supplimentary Examinations, Aug/Sep 2007
ENGINEERING PHYSICS
(Common to Civil Engineering, Mechanical Engineering, Chemical Engineering, Mechatronics, Metallurgy & Material Technology, Production Engineering, Aeronautical Engineering and Automobile Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Explain the principle of superposition of waves.
   (b) Explain the phenomenon of interference.
   (c) With relevant diagram explain Young's experiment on the basis of wave theory. [4+4+8]

2. (a) Explain how nicol prism acts as an analyzer.
   (b) With necessary diagram explain elliptically polarized light.
   (c) Calculate the thickness of quarter wave plate and half wave plate, given that refractive indices of ordinary ray and extra-ordinary ray are 1.653 and 1.644 respectively. Wavelength of light used is 5400 A.U. [6+6+4]

3. (a) Explain how the reverberation time of hall is affected by
      i. its size
      ii. nature of its wall surfaces and
      iii. audience
   (b) Describe a method to measure the sound absorption co-efficient of a material.
   (c) A hall of volume $1586\,m^3$ is found to have reverberation time of 2 sec. If the area of the sound absorbing surface be $650\,m^2$, calculate the average absorption co-effiencient. [6+6+4]

4. (a) With neat diagrams, describe the construction and action of Ruby laser.
   (b) Write the applications of laser. [10+6]

5. (a) Write notes on:
      i. fibre materials
      ii. light sources for fibre optics
      iii. photo-detectors for fibre optics.
   (b) Explain the terms
      i. numerical aperture and
      ii. acceptance angle of a fibre.

   Derive expressions for them. [6+10]

6. (a) What are paramagnetic and diamagnetic materials? Give examples.

(b) Discuss the temperature variation of susceptibilities in paramagnetic and diamagnetic materials. [10+6]

7. (a) Explain Bragg's law of X-ray diffraction.

   (b) Describe Laue's method for determination of crystal structure.

   (c) A beam of X-rays is incident on a NaCl crystal with lattice spacing 0.282 nm. Calculate the wavelength of X-rays if the first order Bragg reflection takes place at a glancing angle of $8^o35'$. Also calculate the maximum order of diffraction possible. [6+6+4]

8. (a) Explain Schottky and Frenkel defects with the help of suitable figures.

   (b) Derive an expression for the number of Schottky defects in equilibrium at a temperature T.

   (c) The fraction of vacancy sites in a metal is 1×10^{-10} at 500 ^{0}C. What will be the fraction of vacancy sites at 1000 ^{0}C? [6+6+4]

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Code No: R05010103 **Set No. 2**

I B.Tech Supplimentary Examinations, Aug/Sep 2007
ENGINEERING PHYSICS
(Common to Civil Engineering, Mechanical Engineering, Chemical Engineering, Mechatronics, Metallurgy & Material Technology, Production Engineering, Aeronautical Engineering and Automobile Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Give the theory of Fraunhofer diffraction due to a single slit and hence obtain the condition for primary and secondary maxima. Using this obtain intensity distribution curve.
   (b) Find the angular width of the central maximum in the Fraunhofer diffraction using a slit of width 1 μm when the slit is illuminated by light of wavelength 600 nm. [12+4]

2. (a) What is piezo-electric effect? Explain.
   (b) How ultrasonic waves can be produced using piezo-electric crystal? Describe.
   (c) Write any four applications of ultrasonics. [4+8+4]

3. (a) Derive Sabine's formula for reverberation time.
   (b) Define the term coefficient of absorption and write short notes on it.
   (c) A hall has dimensions 20 $\times$ 15 $\times$ 5 m^3. The reverberation time is 3.5 sec. Calculate the total absorption of its surfaces and the average absorption coefficient. [6+6+4]

4. (a) With necessary theory and energy level diagram, explain the working of a Helium-Neon gas laser.
   (b) Mention some important applications of lasers. [10+6]

5. (a) Explain the difference between a step-index fibre and graded index fibre.
   (b) What are the advantages of an optical fibre communication system over the conventional ones?
   (c) A fibre has the core and cladding refractive indices 1.45 and 1.44 respectively. Find the relative refractive index difference. [6+6+4]

6. (a) Define the terms magnetic susceptibility, magnetic permeability, magnetic induction and magnetization.
   (b) What are the sources of permanent dipole moment in magnetic materials?
   (c) Explain the important properties of Ferrites. [6+6+4]

7. (a) Explain Bragg's law of X-ray diffraction.
   (b) Describe Laue's method for determination of crystal structure.

(c) A beam of X-rays is incident on a NaCl crystal with lattice spacing 0.282 nm. Calculate the wavelength of X-rays if the first order Bragg reflection takes place at a glancing angle of $8^o35'$. Also calculate the maximum order of diffraction possible. [6+6+4]

8. (a) Write in detail the different kinds of crystal imperfections.

(b) Explain the significance of Burgers vector. [10+6]

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Code No: R05010103 **Set No. 3**

I B.Tech Supplimentary Examinations, Aug/Sep 2007
ENGINEERING PHYSICS
(Common to Civil Engineering, Mechanical Engineering, Chemical Engineering, Mechatronics, Metallurgy & Material Technology, Production Engineering, Aeronautical Engineering and Automobile Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Explain why different colors are exhibited by a thin film when exposed to white light.
   (b) Write the necessary theory to determine the radius of curvature of a lens using Newton's rings method.
   (c) In Young's double slit experiment the separation of slits is 1.9 mm and the fringe spacing is 0.31 mm. The screen is placed at a distance of 1 m from the slits. Find the wavelength of the light? [6+6+4]
2. (a) Explain how nicol prism acts as an analyzer.
   (b) With necessary diagram explain elliptically polarized light.
   (c) Calculate the thickness of quarter wave plate and half wave plate, given that refractive indices of ordinary ray and extra-ordinary ray are 1.653 and 1.644 respectively. Wavelength of light used is 5400 A.U. [6+6+4]
3. (a) How are the superconductors classified? Explain their properties.
   (b) What is Meissner effect?
   (c) Write notes on the applications of superconducting materials. [6+6+4]
4. (a) Give the various pumping mechanisms that are adopted in lasers.
   (b) Discuss the essential features of a laser beam.
   (c) Explain the uses of lasers in various fields. [6+4+6]
5. (a) Explain the principle behind the functioning of an optical fibre.
   (b) Derive an expression for acceptance angle for an optical fibre. How it is related to numerical aperture?
   (c) An optical fibre has a numerical aperture of 0.20 and a cladding refractive index of 1.59. Find the refractive index of core and the acceptance angle for the fibre in water which has a refractive index of 1.33. [4+8+4]
6. (a) What are the properties of diamagnetic materials?
   (b) Explain why the diamagnetic materials repel the magnetic lines of force.
   (c) Explain the properties of paramagnetic materials. [6+4+6]
7. (a) Explain Bragg's law of X-ray diffraction.

(b) Describe Laue's method for determination of crystal structure.

(c) A beam of X-rays is incident on a NaCl crystal with lattice spacing 0.282 nm. Calculate the wavelength of X-rays if the first order Bragg reflection takes place at a glancing angle of $8^o35'$. Also calculate the maximum order of diffraction possible. [6+6+4]

8. (a) Write in detail the different kinds of crystal imperfections.

(b) Explain the significance of Burgers vector. [10+6]

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Code No: R05010103 **Set No. 4**

I B.Tech Supplimentary Examinations, Aug/Sep 2007
ENGINEERING PHYSICS
(Common to Civil Engineering, Mechanical Engineering, Chemical Engineering, Mechatronics, Metallurgy & Material Technology, Production Engineering, Aeronautical Engineering and Automobile Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Explain with theory the Fraunhofer diffraction due to 'n' slits.
   (b) Find the highest order that can be seen with a grating having 15000 lines/inch. The wavelength of the light used is 600 nm. [12+4]

2. (a) Explain in detail, the terms:
      i. Double refraction
      ii. Optic axis
      iii. Positive crystals
      iv. Negative crystals.
   (b) What is Brewster's law? Explain.
   (c) A beam of plane polarized light is converted into a circular polarized light by passing it through a crystal slice of thickness 3 $\times 10^{-5}$ m. Calculate the difference in the refractive indices of the two rays inside the crystal assuming the above thickness to be the minimum value required to produce the observed effect. Wavelength of the light used is 600 nm. [8+4+4]

3. (a) Derive Sabine's formula for reverberation time.
   (b) Define the term coefficient of absorption and write short notes on it.
   (c) A hall has dimensions 20 $\times$ 15 $\times$ 5 m^3. The reverberation time is 3.5 sec. Calculate the total absorption of its surfaces and the average absorption coefficient. [6+6+4]

4. (a) What do you understand by population inversion? How it is achieved?
   (b) Derive the relation between the probabilities of spontaneous emission and stimulated emission in terms of Einstein's co-efficients. [6+10]

5. (a) Explain the basic principle of an optical fibre.
   (b) Describe graded index optical fibre and explain the transmission of signal through it.
   (c) What are different losses in optical fibres? Write brief note on each. [4+8+4]

6. (a) Explain the salient features of anti-ferromagnetic materials.
   (b) Define the terms magnetic susceptibility, magnetic induction and permeability. How is magnetic susceptibility of a material measured? [6+10]

7. (a) Sketch the planes with Miller indices (123) and (221) in the case of a simple cubic structure.
   (b) Derive Bragg's law for X-ray diffraction in crystals.
   (c) When a beam of X-rays of λ=1.8 A.U. is incident on a crystal surface, the second order maximum is obtained at a glancing angle of 15^o. Calculate the corresponding inter-planar spacing. [4+8+4]

8. (a) Distinguish between Frenkel and Schottkey defects.
   (b) Derive an expression for the energy change due to creation of vacancies inside a solid. [8+8]

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