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

I B.Tech Supplimentary Examinations, Aug/Sep 2008
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 analytical treatment of interference of light and hence obtain the condition for maximum and minimum intensity.
   (b) Two coherent sources of intensity 100 Wm^{-2} and 25 Wm^{-2} interfere to form fringes. Find the ratio of maximum intensity to minimum intensity. [10+6]

2. (a) Discuss the various methods by which polarized light can be produced.
   (b) A beam of linearly polarized light is changed into circularly polarized by passing it through a 30 μm thick birefringent crystal. Assuming its thickness is minimum and for a light of wavelength 589.3 nm incident on it normally, find the difference of refractive indices of the ordinary and extra-ordinary rays. [10+6]

3. (a) Explain in detail the basic requirements of an acoustically good hall.
   (b) For an empty auditorium of size 20 × 15 × 10 m^3, the reverberation time is 3.5 sec. Calculate the average absorption co-efficient of the auditorium. What area of the wall should be covered by the curtain so as to reduce the reverberation time to 2.5 sec? Given that the absorption co-efficient of curtain cloth is 0.5. [10+6]

4. (a) Explain the terms:
      i. temporal coherence
      ii. population inversion
      iii. metastable state
      iv. stimulated emission
   (b) Why is the optical resonator required in lasers? Illustrate your answer with neat sketches. [10+6]

5. (a) What is the principle of optical fibre communication? Explain.
   (b) Discuss various types of fibres for light wave communication. [8+8]

6. (a) Explain the origin of permanent magnetic dipole moment.
   (b) Explain the existence of spontaneous magnetization in ferro-magnetic materials.

(c) The magnetic susceptibility of copper is -0.5 $\times$ 10^{-5}. Calculate the magnetic moment per unit volume in copper when subjected to a field whose magnitude in side copper is 10^4 amp/m. [6+6+4]

7. (a) What are Miller indices? Draw (111) and (110) planes in a cubic lattice.
   (b) Explain Bragg's law of X-ray diffraction.
   (c) The Bragg's angle for reflection from the (111) plane in a FCC crystal in the first order, is 19.2^o for an X-ray wavelength of 1.54 A.U. Compute the cube edge of the unit cell. [6+6+4]

8. (a) Explain the various point defects in a crystal.
   (b) Obtain the expression for the equilibrium concentration of vacancies in a solid at a given temperature. [8+8]

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

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

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Differentiate between interference and diffraction.
   (b) Explain Rayliegh's criterion for resolving power of a telescope.
   (c) A plane transmission grating having 6000 lines/cm is used to obtain a spectrum of light from a sodium lamp in the second order. Calculate the angular separation between two sodium lines D_1 and D_2 of wavelengths 5890 A.U. and 5896 A.U. [6+6+4]

2. (a) What is meant by double refraction?
   (b) Explain briefly optic axis and its characteristics.
   (c) Discuss the construction of a nicol prism. [6+4+6]

3. (a) What is meant by superconductivity? Explain.
   (b) Show that the superconductors are perfect diamagnetic materials.
   (c) Write some of the applications of superconductors. [6+6+4]

4. (a) Explain the terms
      i. absorption,
      ii. spontaneous emission
      iii. stimulated emission
      iv. population inversion, relating to laser.
   (b) Describe the principle of lasing action.
   (c) Mention the important characteristics of laser beam. [8+4+4]

5. (a) Derive expressions for the numerical aperture and the fractional index change of an optical fibre.
   (b) Explain the advantages of optical communication system.
   (c) The numerical aperture of an optical fibre is 0.39. If the difference in the refractive indices of the material of its core and the cladding is 0.05, calculate the refractive index of material of the core. [8+4+4]

6. (a) Explain the various properties of paramagnetic materials.
   (b) Explain why the paramagnetic materials does not show Meissner effect.

(c) Mention the salient feature of the ferro-magnetic materials. [6+4+6]

7. (a) Define Miller indices. Sketch the following atomic planes in a simple cubic structure (010), (110) and (111).

   (b) Derive an expression for the inter-planar distance in terms of Miller indices for a cubic structure. [6+10]

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 2008
ENGINEERING PHYSICS
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Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) What is meant by interference of light? State the fundamental conditions for the production of interference fringes.
   (b) Explain with necessary theory the formation of Newton's rings and measurement of wavelength of light. [6+10]

2. (a) Explain why the sky appears blue and red at different times during a day.
   (b) Discuss how the circular and elliptical polarized lights can be produced.
   (c) The refractive index of calcite crystal is 1.658 for ordinary ray and it is 1.486 for extra-ordinary ray. A slice having thickness 0.9 $\times 10^{-4}$ cm is cut from the crystal. For what wavelengths this slice behave as a
      i. quarter wave plate,
      ii. half wave plate? [4+6+6]

3. (a) Explain superconducting phenomenon.
   (b) Distinguish between Type-I and Type-II superconductors.
   (c) Discuss various applications of superconductors. [6+6+4]

4. (a) Explain the terms:
      i. Absorption.
      ii. Spontaneous emission.
      iii. Stimulated emission.
      iv. Pumping mechanism.
      v. Population inversion.
      vi. Optical cavity.
   (b) Mention the medical applications of lasers. [12+4]

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]

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6. (a) What are the characteristics of soft magnetic materials?
   (b) What is ferro-magnetic curie temperature? Discuss the behaviour of a ferro-magnetic material below the Curie temperature.
   (c) The magnetic induction in the interior of a certain solenoid has the value of 6.5 $\times 10^{-4}$ T when the solenoid is empty. When it is filled with iron, the induction becomes 1.4 T. Find the relative permeability of iron. [6+6+4]

7. (a) State and explain Bragg's law.
   (b) Describe with suitable diagram, the powder method for determination of crystal structure.
   (c) A beam of X-rays of wavelength 0.071 nm is diffracted by (110) plane of rock salt with lattice constant of 0.28 nm. Find the glancing angle for the second order diffraction. [6+6+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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Code No: R05010103 **Set No. 4**

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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 interference and obtain the condition for constructive and destructive interference.
   (b) Light waves of wavelength 650 nm and 500 nm produce interference fringes on a screen at a distance of 1 m from a double slit of separation 0.5 mm. Find the least distance of a point from the central maximum where bright fringe due to both coincide. [10+6]
2. (a) What is meant by polarization of light?
   (b) Describe an experiment that shows light is not propagated as longitudinal waves.
   (c) What is plane of vibration? [6+6+4]
3. (a) What is reverberation time?
   (b) Explain how the sound absorption coefficient of a material is determined.
   (c) The reverberation time is found to be 1.5 sec. for an empty hall and it is found to be 1.0 sec when a curtain cloth of 20 m^2 is suspended at the centre of the hall. If the dimensions of the hall are $10 \times 8 \times 6$ m^3, calculate the coefficient of absorption of curtain cloth. [2+8+6]
4. (a) Explain the need of a cavity resonator in a laser.
   (b) With the help of suitable diagrams, explain the principle, construction and working of a Ruby laser. [6+10]
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) Define crystal lattice, unit cell, lattice parameter and co-ordination number.
   (b) Consider a Body Centered Cubic lattice of identical atoms having radius R. Compute
      i. the number of atoms per unit cell

ii. the co-ordination number and
iii. the packing fraction. [8+8]

7. (a) Derive Bragg's law of X-ray diffraction.
   (b) Describe Bragg's X-ray spectrometer and explain how Bragg's law can be verified.
   (c) Monochromatic X-rays of λ=1.5 A.U. are incident on a crystal face having an interplanar spacing of 1.6 A.U. Find the highest order for which Bragg's reflection maximum can be seen. [6+6+4]

8. (a) Give an account on the effects of dislocations on the properties of solids.
   (b) Explain the significance of Burgers vector. [10+6]

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