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Code No: R10103/R10

Set No. 1

I B.Tech I Semester Supplementary Examinations, Aug. 2015
ENGINEERING PHYSICS-I
(Common to Civil Engineering, Electrical & Electronics Engineering, Mechanical Engineering, Electronics & Communication Engineering, Computer Science & Engineering, Chemical Engineering, Electronics & Instrumentation Engineering, Bio-Medical Engineering, Information Technology, Electronics & Computer Engineering, Aeronautical Engineering, Bio-Technology, Automobile Engineering, Mining and Petroliem Technology)

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

Answer any FIVE Questions
All Questions carry equal marks
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1. (a) Define interference of light.
   (b) Derive an expression for fringe width in interference pattern and show that the fringes are uniformly spaced with relevant ray diagram.
   (c) Two slits separated by a distance of 0.2mm are illuminated by a monochromatic light of wavelength 550nm. Calculate the fringe width on a screen at distance of 1m from the slits. [2+9+4]

2. (a) Differentiate between interference and diffraction intensity patterns. How do you differentiate between the Fresnel and Fraunhofer diffractions?
   (b) How many orders will be visible, in the Grating Spectrum if the wavelength of light is 5000 Å. Given that the number of lines per centimeter on the grating is 6655. [11+4]

3. (a) How the polarized light is different from ordinary light?
   (b) Write notes on Nicol prism.
   (c) Find the minimum thickness of half and quarter wave plates for a light beam, λ=589.3nm if μ_e= 1.48640 and μ_o= 1.65833. [4+7+4]

4. (a) Obtain expressions for atomic radius, coordination number and packing fraction for SC, BCC and FCC lattices.
   (b) Estimate the percentage of void space in FCC crystal.
   (c) Determine the number of atoms per unit cell of lead which has an FCC structure. Atomic weight of Pb = 207.2, density of Pb = 11.36×10^3kg/m^3 and a = 3.2 A^o. Also $N_A = 6.023\times10^{26}$ /kg mole. [5+5+5]

5. (a) What are Miller indices? How are they obtained?
   (b) Deduce the expression for the interplanar distance in terms of Miller indices for a cubic system.
   (c) Obtain Miller indices of a plane which intercepts at a, b/2 and 3c in simple cubic unit cell. Draw a neat diagram showing the plane. [5+6+4]

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6. (a) What are the differences between spontaneous emission and stimulated emission?
   (b) What are important components of a Laser? Explain.
   (c) Explain the role of optical cavity in laser. [6+6+3]

7. (a) Explain Acceptance angle and derive expression for it.
   (b) Write notes on Step Index and Graded Index fibers.
   (c) For an optical fiber fractional index change is 0.14 and refractive index of cladding is 1.3. Calculate refractive index of core. [5+6+4]

8. (a) Explain the working of Ultrasonic flaw detector.
   (b) Explain three different and most common types of scans used in Ultrasonic inspection. [6+9]

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Set No. 2

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

Answer any FIVE Questions
All Questions carry equal marks
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1. (a) What is Superposition Principle?
   (b) Show that the fringe width of bright and dark fringes in Young's experiment is the same.
   (c) Two coherent sources whose intensity ratio is 36:1 produce interference fringes. Deduce the ratio of maximum intensity to minimum intensity. [2+8+5]

2. (a) Explain what is meant by diffraction of light. How diffraction is different from interference?
   (b) Discuss Fraunhofer single slit diffraction. Draw intensity distribution curves and give conditions for bright and dark fringes in single slit diffraction pattern. [5+10]

3. (a) Discuss various methods by which polarized light can be produced.
   (b) What are Quarter and Half wave plates?
   (c) Calculate the thickness of half wave plate of quartz for a wavelength 500nm. Here μ_e= 1.553 and μ_o= 1.544. [8+3+4]

4. (a) Classify various lattice types in the cubic crystal system and specify the effective number of lattice points per unit cell in each type.
   (b) NaCl crystal has FCC structure. The density of NaCl is 2.18 gm/cm^3. Calculate the distance between the two adjacent atoms. (NaCl Molecular weight = 58.5) [7+8]

5. (a) What are Miller Indices? How are they obtained?
   (b) State and prove Bragg's law of X-ray diffraction.
   (c) What is the limiting condition for Bragg's law? [5+8+2]

6. (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?

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(c) What are the three Einstein coefficients? Derive the relations between them. [2+5+8]

7. (a) Describe the basic elements of an optical fiber in communication system with a neat diagram.

   (b) Write notes on the applications of optica fiber.

   (c) A fiber has the core and cladding refractive indices 1.45 and 1.4 respectively. Find the fractional change in refractive index. [5+5+5]

8. (a) What is ultrasonic testing and explain the basic principle?

   (b) What are the properties of Ultrasonic Waves? [7+8]

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Set No. 3

I B.Tech I Semester Supplementary Examinations, Aug. 2015
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Time: 3 hours **Max Marks: 75**

Answer any FIVE Questions
All Questions carry equal marks
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1. (a) Account for the circular shape of 'Newton's rings' in interference pattern.
   (b) Obtain the expression for the diameter of the nth dark ring in the case of Newton's rings.
   (c) In Newton's rings experiment, the diameters of the 5thand 25th rings are 0.3cm and 0.8cm respectively. If the radius of curvature of the plano-convex lense is 10cm, find the wavelength of the incident light. [5+6+4]

2. (a) What are the types of diffractions and give the differences between them.
   (b) Obtain the condition for primary maxima in Fraunhofer diffraction due to single slit and derive an expression for width of the central maxima. [5+10]

3. (a) What is quarter wave plate? Deduce extremism for its thickness
   (b) Draw a ray diagram for extraordinary and ordinary rays before and after passing through a quarter wave plate.
   (c) At what wavelength, the given quarter wave plate of wavelength 600nm will act as half wave plate. [5+5+5]

4. (a) Define Coordination Number, Nearest Neighbor Distance, Atomic Radius and Packing Fraction.
   (b) Obtain expressions for Atomic Radius and Packing Fraction for SC, BCC and FCC lattices. [5+10]

5. (a) State and explain Bragg's law of X-ray diffraction.
   (b) Explain the Principle, procedure and advantages of Debye-Scherrer method of X- ray diffraction.
   (c) The distance between (110) planes in a BCC structure is 0.203nm. What is the size of the unit cell? What is the radius of the atom? [3+8+4]

6. (a) Explain the basic principles for producing laser beam.
   (b) Distinguish between ordinary light and laser light.
   (c) Explain the uses of laser in various fields. [6+5+4]

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7. (a) What is meant by total internal refection? Explain it with neat diagram.
   (b) Derive an expression for the numerical aperture of an optical fiber. [7+8]

8. (a) Explain different types of scans in NDT.
   (b) Explain in detail the classification of the different types of ultrasonic waves with diagrams and specific utility. [7+8]

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Set No. 4

I B.Tech I Semester Supplementary Examinations, Aug. 2015

ENGINEERING PHYSICS-I

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Time: 3 hours Max Marks: 75

Answer any FIVE Questions
All Questions carry equal marks
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1. Explain the following:
   (a) Superposition Principle
   (b) Concept of Coherence
   (c) colours in thin films [3x5=15]

2. (a) What is meant by diffraction of light? Explain it on the basis of Huygen's wave theory.
   (b) Obtain the condition for primary maxima in Fraunhofer diffraction due to single slit and derive an expression for width of the central maxima.
   (c) Write notes on Rayleigh's Criterion [4+7+4]

3. (a) What is Malus' law? What is Brewster's law? Prove that the angle between reflected and refracted beams is 90^0, if the angle of incidence corresponds to Brewster's angle.
   (b) The refractive index of calcite for ordinary ray is 1.658 and for extra ordinary ray is 1.486. The slice having the thickness 0.9×10^{-4} cm is cut from the crystal. For what wavelength this slice acts as half wave plate? [11+4]

4. (a) Describe the seven crystal systems with diagrams.
   (b) Classify various lattice types in the crystal system. [10+5]

5. (a) State Bragg's law of X-ray diffraction.
   (b) Describe Bragg's X-ray spectrometer and explain how Bragg's law can be verified.
   (c) Draw (001), (120) and $(\bar{2}11)$ planes in a cubic lattice. [2+9+6]

6. (a) Derive Einstein coefficients and explain their significance?
   (b) Describe the construction and working of a semiconductor Laser? [7+8]

7. (a) Describe the graded index fiber and explain the transmission of light through it.

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(b) What are the merits of optical fiber communication system.

(c) A Step index optical fiber has refractive indices of core and cladding $n_1 = 1.53$, $n_2 = 1.50$ respectively. If the radius is $50\mu m$, them calculate the number of modes in the fiber .Given the wavelength of input signal $\lambda_0 = 1\mu m$. [5+5+5]

8. (a) What are couplants? Explain the use of couplants in ultrasonic testing.

   (b) Calculate the frequency of ultrasonic waves with inductance 1 Henry and capacitance $0.025\mu F$ of LC circuit in piezoelectric method [8+7]

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