Code No: R10103/R10 **Set No. 1**

I B.Tech I Semester Regular Examinations, February 2013
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) Explain young's double slit experiment.
   (b) Derive an expression for wavelength of light in terms of fringe width in interference pattern due to young's double slit. [7+8]
2. (a) Explain with necessary theory, the Fraunhofer diffraction due to 'n' slits.
   (b) Calculate the maximum number of orders possible for a plane diffraction grating. [12+3]
3. (a) State and prove malus law.
   (b) Write notes on quarter and half wave plates? [8+7]
4. (a) What is Primitive cell? How does it different from unit cell? [3+9+3]
   (b) Illustrate the SC, BCC and FCC crystal structures.
   (c) Derive the expression for density of the crystal in terms of lattice constant.
5. (a) Explain how the crystal structure will be determined by Powder method?
   (b) Calculate distance between two successive parallel planes having miller indices (hkl). [7+8]
6. (a) Write notes on Population inversion and lasing action.
   (b) Explain the three main components of any laser system. [6+9]
7. (a) What are the conditions to produce total internal reflection in optical fiber.
   (b) Describe structure of different types of Optical fibers with ray paths.
   (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. [3+8+4]
8. (a) Discuss various non-destructive testing systems which are commonly adopted in industries using ultrasonics.
   (b) Describe the ultrasonic flaw detector with suitable diagram. [10+5]

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Code No: R10103/R10 **Set No. 2**

I B.Tech I Semester Regular Examinations, February 2013
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) Explain the phenomenon of interference.
   (b) What are the necessary conditions for obtaining interference fringes.
   (c) Give the analytical treatment of interference of light and hence obtain the condition for maximum and minimum intensity. [3+4+8]

2. (a) Give the theory of plane transmission grating and deduce the following expression $\sin\theta = Nn\lambda$. A parallel beam of sodium light is normally incident on a plane transmission grating having 4250 lines per cm and a second order spectral line is observed at an angle of30^0. Calculate the wave length of light.
   (b) Calculate the maximum number of orders possible with a plane diffraction grating.

3. (a)Distinguish between plane, circularly and elliptically polarized light.
   (b) A beam of linearly polarized light is converted into a circularly polarized light by passing it through a crystal slice of thickness 3×10^{-7}cm. 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 light used is 600nm.

4. (a) What is unit cell? What is primetime cell?
   (b) What are the seven crystal systems and write the relationship between lattice parameters in various crystal systems.
   (c) During its conversion from Iron BCC to FCC decrease of volume is 0.5%. Show that the maximum radius of the sphere that can just fit into the void at the center of FCC structure coordinated by the facial atoms is 0.414r, where r is the radius of atom. [3+5+7]

5. (a) Discuss Bragg's law of X-ray diffraction.
   (b) Describe the powder method to determine crystal structure.
   (c) Monochromatic X-rays of wavelength 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. [4+7+4]

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6. (a) Explain the following:
(i)Life time of an energy level
(ii) Optical pumping process
(b) Explain the need of a cavity resonator in a laser.
(c) With the help of suitable diagrams, explain the principle, construction and working of a Ruby laser. [4+3+8]

7. (a) Explain the propagation of light rays through optical fibers.
(b) Explain construction of in optical fibers.
(c) The refractive indices of the core and cladding of a fiber are 1.54 and 1.5 respectively. Calculate its numerical aperture and maximum acceptance angle. [4+4+7]

8. (a) What are Ultrasonic transducers? Write a note on quartz crystal transducer.
(b) Explain the need of inspection standards in ultrasonic inspection.
(c) Write a note on couplants used in ultrasonic inspection. [6+6+3]

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Code No: R10103/R10 **Set No. 3**

I B.Tech I Semester Regular Examinations, February 2013
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) Account for the circular shape of 'Newton's rings' in interference pattern.
   (b) Obtain the expression for the diameter of the n^{th} dark ring in the case of Newton's rings.
   (c) In Newton's rings experiment, the diameters of the $5^{th}$and 25^{th} 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) 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) Define double refraction. Describe double refraction in calcite crystal to produce polarized light.
   (b) What are uniaxial and biaxial crystals (or) positive and negative crystals? Give examples. Distinguish between them. [6+9]

4. (a) Illustrate the Face Centre Cubic crystal structure.
   (b) Find the Coordination Number, Nearest Neighbour Distance, Atomic Radius and Packing Fraction for FCC lattice.
   (c) Is unit cell of FCC lattice a primitive or not? Why? [4+9+2]

5. (a) Explain how the crystal structure will be determined by Powder method?
   (b) Calculate distance between two successive parallel planes having miller indices (hkl). [7+8]

6. (a) Explain the purpose of an active medium in a laser.
   (b) With the help of suitable diagram, explain the principle, construction and working of a He-Ne laser.

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(c) Calculate the wavelength of emitted radiation from GaAs which has a band gap of 1.44 ev. [2+9+6]

7. (a) Define fractional index change. How is it related with Numerical Aperture.
   (b) Write notes on Attenuation losses in optical fiber.
   (c) Calculate the fractional index change for a given optical fiber. If the refractive indices of the core and cladding are 1.563 and 1.498. [5+5+5]

8. (a) Explain longitudinal and transverse modes of wave propagation. [7+8]
   (b) Explain the calibration and inspection standards in Ultrasonic flaw detection.

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Code No: R10103/R10 **Set No. 4**

I B.Tech I Semester Regular Examinations, February 2013
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) Discuss in detail Fraunhofer diffractions due to double slit.
   (b) Write notes in missing of orders in the double slit diffraction pattern. [8+7]
3. (a) What is meant by Double Refraction?
   (b) Write notes on Optic axis and its characteristics.
   (c) Discuss the construction and action of Nicol prism. [2+5+8]
4. (a) Illustrate or compare SC, BCC and FCC crystal structures.
   (b) Estimate the packing fractions of FCC crystal
   (c) Copper has FCC structure and its atomic radius is 0.1278 nm. Calculate its density. Take the atomic weight of copper as 63.5 amu. [5+5+5]
5. (a) State and explain Bragg's law.
   (b) Explain how the X-ray diffraction can be employed to determine the crystal structure.
   (c) Find the ratio of inter planar distances of (100), (110) and (111) planes for a simple cubic structure. [5+6+4]
6. (a) Explain the three Einstein's coefficients.
   (b) Describe the construction and working of Helium – Neon laser [6+9]
7. (a) Explain Acceptance angle and derive expression for it.
   (b) Write notes on Step Index and Graded Index fibers.

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(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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