



Code No: R10103/R10

Set No. 1

I B.Tech I Semester Supplementary Examinations, Oct/Nov 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
Petroleum Technology)

Time: 3 hours

Max Marks: 75

Answer any FIVE Questions
All Questions carry equal marks

- (a) Describe the principle and formation of Newton's rings and explain a method to determine wavelength of light using Newton's rings setup.
(b) Newton's rings are observed in the reflected light of wavelength $5900 \text{ \AA}$. The diameter of 10^{th} dark ring is 0.5 cm . Find the radius of curvature of lens used. [11+4]
- (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]
- (a) What is a quarter wave plate? Reduce its thickness for a given wave length in terms of its refractive indices.
(b) Find the minimum thickness of half wave and quarter wave plates for a light beam of wavelength 589.3 nm . If $\mu_o = 1.65833$ and $\mu_e = 1.48640$. [11+4]
- (a) What is a crystal? Why are most solids crystalline in nature?
(b) Explain the structures of NaCl and CsCl? [5+10]
- (a) State and explain Bragg's law.
(b) Describe with suitable diagram, the powder method of determination of crystal structure.
(c) Monochromatic X-rays of wavelength $1.5 \text{ \AA}$ are incident on a crystal face having an interplanar spacing of $1.6 \text{ \AA}$. Find the highest order for which Bragg's reflection maximum can be seen. [4+7+4]
- (a) What are the main components of any laser system? Explain their role in laser production.
(b) What is the reason for monochromaticity of laser beam?
(c) What are the applications of lasers in medicine? [9+3+3]
- (a) Describe the construction of an optical fiber and give typical dimensions of various parts.





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- (b) Write notes on Attenuation losses in optical fiber communication.
(c) . Calculate the angle of acceptance of a given optical fiber, if the refractive indices of the core and cladding 1.563 and 1.498 respectively.
8. (a) What is ultrasonic testing and explain the basic principle?
(b) What are the properties of Ultrasonic Waves?

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Engineering, Bio-Technology, Automobile Engineering, Mining and
Petroleum Technology)

Time: 3 hours

Max Marks: 75

Answer any FIVE Questions
All Questions carry equal marks

- (a) Define Interference of light. Describe the Young's double slit experiment on the interference of light and obtain an expression for the bandwidth of the interference pattern.
(b) In Young's experiment, the screen is placed at a distance of 1 metre from the slits, the slits are 2 mm apart and are illuminated by the light of wavelength 5890 Å. Calculate the fringe width. [11+4]
- (a) Differentiate between interference and diffraction intensity patterns. How do you differentiate the Fresnel diffraction to that of Fraunhofer diffraction?
(b) How many orders will be visible, if the wavelength of light is 5000 Å. Given that the number of lines per centimeter on the grating is 6655. [11+4]
- (a) What do you mean by Polarisation?
(b) Distinguish between Polarised and Unpolarised lights.
(c) What are Quarter and Half-wave plates. Drive the expressions for their thickness? [4+5+6]
- (a) What is a Bravais lattice? List out the different types of Bravais lattices which are possible among the seven different crystal systems.
(b) Estimate the percentage of void space in BCC Crystal.
(c) Metallic Iron changes from BCC to FCC at 910° C and correspondingly the atomic radius varies from 1.258 Å to 1.292 Å. Calculate the percentage of volume change during this structural change.
- (a) Explain Bragg's law of X-ray diffraction.
(b) Describe Laue's method for determination of crystal structure.
(c) The Bragg's angle for reflection from the (110) plane in FCC crystal is 19.2° for an X-ray wavelength of 1.54 Å. Compute the cube edge of the unit cell. [3+8+4]
- (a) What is laser? What are the important characteristics of lasers?
(b) Derive the relation between different Einstein coefficients.
(c) What are the industrial applications of lasers? [5+7+3]
- (a) What are the conditions to produce total internal reflection in optical fiber.



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- (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 refractive 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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Time: 3 hours

Max Marks: 75

Answer any FIVE Questions
All Questions carry equal marks

- (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. [5+10]
- (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]
- (a) What is Malus' law? What is Brewster's law? Prove that the angle between reflected and refracted beams is 90° , 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]
- (a) Describe the seven crystal systems with diagrams.

(b) Classify various lattice types in the crystal system. [10+5]
- (a) What are Miller indices? How are they derived? What are the important features of Miller indices?

(b) Derive Bragg's law? Explain the limiting condition for Bragg's law [7+8]
- (a) Describe the construction and working of Semiconductor laser.

(b) Mention any two applications each of laser in Industry and Scientific fields. [12+3]
- (a) Describe the structures of different types of optical fibers with ray paths.

(b) What are the conditions to produce total internal reflection in optical fiber.

(c) Calculate the numerical aperture for an optical fiber with core and cladding refractive indices being 1.48 and 1.45 respectively. [8+3+4]
- (a) Explain the basic principle of ultrasonic testing.

(b) What are the advantages and limitations of ultrasonic testing. [5+10]





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Time: 3 hours

Max Marks: 75

Answer any FIVE Questions
All Questions carry equal marks

- (a) Define Interference of light. Describe the Young's double slit experiment on the interference of light and obtain an expression for the bandwidth of the interference pattern.
(b) In Young's experiment, the screen is placed at a distance of 1 metre from the slits, the slits are 2 mm apart and are illuminated by the light of wavelength 5890 Å.U. Calculate the fringe width. [11+4]
- (a) Explain how you would use the grating to determine the wave length of light.
(b) What is the highest order of spectrum which may be seen with monochromatic light of wave length 6000 Å by means of diffraction grating with 5000 lines/cm. [11+4]
- (a) What is Malus' law? What is Brewster's law? Prove that the angle between reflected and refracted beams is 90° , 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]
- (a) Define Coordination Number, Nearest Neighbour Distance, Atomic Radius and Packing Fraction.
(b) Explain the crystal structures of BCC and FCC crystals. Give two examples for each. [4+11]
- (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 Å.U. are incident on a crystal face having an interplanar spacing of 1.6 Å.U. Find the highest order for which Bragg's reflection maximum can be seen. [4+7+4]
- (a) What is meant by life time of an energy level? What are the life times of ground state, excited state and metastable state?





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- (b) Derive the relation between different Einstein coefficients.
(c) Describe the lasing action in lasers. [5+7+3]
7. (a) Explain the terms Acceptance angle and Numerical Aperture.
(b) Derive expressions for Acceptance angle and Numerical Aperture of an Optical fiber.
(c) Calculate the Numerical Aperture for an optical fiber with 1.48 and 1.45 as refractive indices of core and cladding respectively. [3+8+4]
8. (a) Explain different types of scans in NDT.
(b) Discuss various nondestructive testing systems which are commonly adopted in industries using ultrasonics. [7+8]

