

College of Engineering, Pune
END SEMESTER EXAM Nov/Dec 2009
F.Y.B.TECH (ALL BRANCHES)
AS 101 - PHYSICS-I

Friday, 4-12-2009
Timing: 10.00am-1.00pm

Max. Marks: 50
Duration- 3Hrs

Instructions:

1. All questions are compulsory.
 2. Figures to the right indicate full marks.
 3. Draw neat labeled diagram where required.
 4. Do not keep mobile phones with you.
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- Q1. A. (i) Explain formation of colors in thin films. 2
(ii) Why does a film appear black when it is excessively thin? 1
- B. Prove that, for Newton rings in reflected light, the diameter of bright rings are proportional to the square root of odd natural numbers. 4
- C. Draw a neat labeled diagram of Michelson Interferometer. 3
- OR**
- D. A square piece of cellophane film, with refractive index of 1.5, has a wedge shaped section, so that its thickness at two opposite sides is t_1 and t_2 . If, with the light of wavelength 6000\AA , number of fringes appearing are 10, calculate the difference (t_1-t_2) . 3
- Q2. A. Give the theory of plane diffraction grating and obtain the conditions for the formation of principal maxima and minima. 6
- B. (i) Differentiate between Fresnel and Fraunhofer diffraction. 2
(ii) Explain one engineering application of LASER. 2
- OR**
- C. (i) Two polarizing sheets have their polarizing directions parallel so that the intensity of the transmitted light is maximum. Through what angle must either sheet be turned so that the intensity becomes $\frac{1}{2}$ and $\frac{1}{4}$ of the initial value. 2
(ii) What is the least distance between two objects on moon's surface which can be resolved by a telescope of diameter 5 m? The distance between earth and moon is 3,84,000 Km and the mean wavelength of moon's light is 5890\AA . 2
- Q3 A. Explain Fresnel theory of optical activity and derive an 5

expression for the same.

- B. (i) Write a short note on polaroid. 3
(ii) Explain Kerr effect. 2

OR

- C. Explain construction, working and limitations of ruby laser 5

- Q4. A. Starting from Schrodinger time independent wave equation, derive an expression for the energy and wave function of a particle in a rigid box. Explain the same. 6

- B. Discuss quantum mechanically the problem of a linear harmonic oscillator and obtain its Eigen values. Also write significance of zero point energy. 4

OR

- C. (i) (a) Why should ψ and $d\psi/dx$ be continuous everywhere? 1

- (b) Why are we not aware of quantization in daily experience? 1

- (ii) The spacing between the nuclei of a certain crystal is 1.2 \AA . At what angle will the first order Bragg reflection occur for thermal neutrons (kinetic energy is 0.025 eV). 2

- Q5 A. Derive an expression for Schrodinger time independent wave equation. 5

- B. Define optical pumping and population inversion. 2

OR

- C. Differentiate between spontaneous and stimulated emission. 2

- D. Attempt **any one**

- (i) Write a short note on tunnel diode. 3

- (ii) (a) State uncertainty principle. 1

- (b) An electron is confined to a box of length 10^{-9} m . Calculate the minimum uncertainty in its velocity. 2
Given that $m_e = 9.1 \times 10^{-31} \text{ Kg}$, $h = 6.62 \times 10^{-34} \text{ J-s}$