



QP Code : 11867

(2 Hours)

[Total Marks : 60

- N.B. :** (1) Questions No. 1 is **compulsory**.
 (2) Attempt any **three** questions from Q. Nos. 2 to 6.
 (3) Assume **suitable** data wherever **required**.

1. Attempt any **five** :-

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- (a) A Light of wavelength 5880 \AA is incident on a thin film of glass of R.I. = 1.5 such that the angle of refraction in the plate is 60° . Calculate the smallest thickness of the plate which will make it dark by reflection.
- (b) What is grating and grating element ?
- (c) Define the terms :-
 - (i) Total internal reflection
 - (ii) Numerical Aperature
 - (iii) Acceptance angle.
- (d) Differentiate spontaneous and stimulated emission of radiation.
- (e) An electron is bound in one dimensional potential well of width 2 \AA but of infinite height. Find its energy values in second excited state.
- (f) In phase measurement by lissajous pattern ellipse is obtained with major axis of 2 cm and minor axis of 0.8 cm. Calculate phase change.
- (g) Why is superconductor termed as 'Perfect Diamagnet.'

- 2. (a) With proper digram and necessary expressions explain how Newton's ring experiment is useful to determine the radius of curvature of planoconvex lens. 8
- (b) Derive the expression for numerical Aperature for a step Index fibre. The N. A. of an optical fiber is 0.5 and core R.I. is 1.54. Find refractive index of cladding. 7
- 3. (a) With neat energy level diagram describe the construction and working of He-Ne Laser. 8
- (b) Explain the interference in thin parallel film and derive the expression for path difference between reflected rays, hence obtain the conditions of maxima and minima for interference with monochromatic light. 7
- 4. (a) For plane transmission grating prove that $d \sin \theta = n\lambda$, $n = 1, 2, 3, \dots$ 5
- (b) What is Heisenberg's uncertainty principle ? Prove that electron cannot servive in the nucleous. 5
- (c) Differentiate Type-I and TYpe-II superconductors. 5

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5. (a) Calculate the minimum no. of lines in a grating which will just resolve in the first order whose wavelengths are 5890 \AA and 5896 \AA . 5
- (b) Derive one dimensional time dependent schrodinger equation for matter wave. 5
- (c) Explain with neat diagram principle and working of SEM. 5
6. (a) An electron and a photon each have a wavelength of 2 \AA . What are their momentum and energies ? 5
- (b) Explain construction and working of cathode Ray Oscilloscope. 5
- (c) What are carbon nano tubes ? Write their properties. 5
