

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 A° 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 $2A^\circ$ 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.

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(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.

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3. (a) With neat energy level diagram describe the construction and working of He-Ne Laser.

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(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.

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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

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