QP Code : 5808

(2 Hours) [Total Marks : 60

N.B.: (1) Question No.1 is compulsory.
(2) Attempt any **three** questions from Q.2 to Q.6
(3) Use suitable data wherever required.
(4) Figures to **right** indicate **full** marks.

1. Attempt any **five** of the following: 15
   (a) Fringes of equal thickness are observed in a thin glass wedge of R.I-1.52. The fringe spacing is 1mm and wavelength of light used is 5893A°. Calculate the angle of the wedge.
   (b) What is meant by diffraction? State its types and differentiate them.
   (c) The core diameter of multimode step Index fibre is 50μm. The numerical aperature is 0.25. Calculate the no. of guided modes at an operating wavelength of 0.75μm.
   (d) Differentiate spontaneous and stimulated emission process related to laser operation.
   (e) How is phase difference between two A.C. signals measured by CRO?
   (f) What is De-Broglie wavelength of an electron Which has been accelerated from rest through a potential difference of 100V?
   (g) How can the 'Maglev' train have very high speed?

2. (a) Show that the diameter of Newton's ring is directly proportional to square root of ring number. In a Newton's ring pattern one of the dark ring due to light of wavelength 7000A° is found to coincide with the dark ring of next order due to 5000A°. If the radius of curvature of the lens is 148.8cm. Find the diameter of the overlapping dark ring. 8

   (b) Define: (i) Numerical aperature 6
       (ii) Total internal reflection
       (iii) Acceptance angle
       Derive the expression for numerical aperature of step index fibre.

3. (a) What is Holography? Explain the construction and reconstruction of Hologram with neat diagrams. 8
   (b) Why are the fringes in Wedge shaped film straight? Derive the conditions of maxima and minima for interference in wedge shaped film. 7

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4. (a) A diffraction grating used at normal incidence gives a yellow line (λ=6000A°) in a certain spectral order superimposed on a blue line (λ=4800A°) of next higher order. If the angle of diffraction is $\sin^{-1}(3/4)$, Calculate the grating element.   5

   (b) Derive Schrodingers time-independent wave equation.   5

   (c) Differentiate Type-I and Type-II super conductor.   5

5. (a) The visible spectrum ranges from 4000A° to 7000A°. Find the angular breadth of the first order visible spectrum produced by a plane grating having 6000 lines/cm when light is incident normally on the grating.   5

   (b) Show that the energy of an electron in a box varies as the square of the natural number.   5

   (c) What are carbon-nano tubes? Explain its properties?   5

6. (a) With single slit electron diffraction, prove Heisenberg's uncertainty principle.   5

   (b) Explain the principle, construction and working of CRT with neat diagram.   5

   (c) Explain the top down approach and bottom up approach to prepare nanomaterials.   5