Q. P. Code : 530005

(2 Hours) [Marks : 60]

N.B. (1) Question no 1 is compulsory.
  (2) Attempt any three questions from the remaining questions.
  (3) Assume suitable data and symbols if requited.
  (4) Figures on the right indicate full marks.

1. Attempt any five: **15**
  (a) Why the Newton's rings are circular and fringes in wedge shaped film are straight?
  (b) What is Rayleigh's criteria of resolution? How to increase resolving power diffraction grating?
  (c) A fibre cable has an acceptance angle of 30° and core index of refractive index 1.4. Calculate the retractive index of cladding.
  (d) What is pumping in Laser? Give the types of puming.
  (e) An electron is bound in one dimensional potential well of width 2.5A° that of infinite height find its energy in first excited state
  (f) How Lissajous figures are used to measure unknown frequency.
  (g) Why is superconductor is termed as perfect diamagnet?

2. (a) For Newton's ring, prove that diameters of nth dark ring is directly proportional **08** to the square root of natural number. In Newton's ring experiment the diameter of nth and $(n+8)^{th}$ bright rings ar 4.2mm and 7mm respectively. Radius of curvature of lower surface of lens is 2m. Determine the wavelength of light used.

  (b) What is monomode and multimode fibre? Explain the term V-number calculate **07** the no of modes an optical fibre of 40 μm will transmit as its core and cladding retractive indies are 1.5 and 1.46 respectively. Wavelength of light used is 1.5 μm.

3. (a) What is the fundamental principle of a Hologram? How is it produced and how **08** is the image constructed by it ?
  (b) Why we see beautiful colours in thin film when it is exposed to sunlight? **07** Obtain expression for path difference between two reflected rays in thin transparent film of uniform thickness and write the conditions of maxima & minima.

TURN OVER

4. (a) What is grating element? Derive condition for absent spectra in plane transmission grating and explain with example. **05**

    (b) What is Heisenbregs' uncertainty principle? An electron has a speed of 300 m/sec. With an accuracy of 0.001%. Calculate the certainty with which we can locate the position of an electron. **05**

    (c) What do you mean by critical magnetic field and critical temperature? A lead superconductor with Tc=7.2k has critical magnetic field of 6.5×10^3 A/m at absolute zero. What would be the magnitude of critical magnetic field at 5k temperature? **05**

5. (a) In plane transmission grating the angle of diffraction for the second order principal maxima for the wavelength 5×10^{-5}cm is 35°. Calculate the no. of lines/cm on diffraction grating. **05**

    (b) Derive one dimensional time independent Schrodinger wave equation for matter wave. **05**

    (c) With neat diagram explain the construction and working of Atomic force Microscope. **05**

6. (a) The electron which is at rest is accelerated through a potential difference of 200V. **05**
        Calculate : i) The velocity of electron
                   ii) De-Brogulie wavelength
                   iii) Momentum.

    (b) Explain how Lissajous figures are used to determine the phase difference between two A.C. signals. **05**

    (c) What are nano materials? Explain any two methods for synthesis of Nanoparticles. **05**

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