

- N.B. :** (1) Question No.1 is compulsory.  
 (2) Solve any four questions from Q. Nos. 2 to 7.  
 (3) Use suitable data wherever necessary.  
 (4) Figures to the right indicate full marks.  
 (5) Illustrate your answer with sketches wherever necessary.

1. Solve any five from the following :— 15
- Why are Newton's rings are circular ?
  - What do you mean by diffraction and state its types ?
  - What do you mean by Vacuum ? What are various gauges used to measure Vacuum ?
  - What is Biophysics ? Discuss its scope.
  - Define relative permeability and susceptibility. Write the relation between them.
  - Find the energy of neutron in units of electron volt whose DeBroglie wavelength is  $1\text{A}^\circ$  (Given  $m_n = 1.674 \times 10^{-27} \text{ kg}$ ,  $h = 6.62 \times 10^{-34} \text{ J.sec.}$ ).
  - What is pumping in LASER ? Give the types of pumping.
  - Define the terms : (i) Total Internal Reflection.  
 (ii) Numerical Aperture (NA)  
 (iii) Acceptance Angle.
2. (a) Prove that in Newtons ring experiment diameter of  $n^{\text{th}}$  dark ring is proportional to  $\sqrt{n}$ . What will be the ring number which will have double the diameter that of  $40^{\text{th}}$  dark ring ? 8
- (b) What does the word LASER stand for ? Explain the following terms related to LASER with appropriate figures (i) Absorption (ii) Spontaneous emission (iii) Stimulated absorption. 7
3. (a) Derive one-dimensional time dependent Schrodinger equation for Matter Waves. 8
- (b) White light falls normally on a soap film of thickness  $5 \times 10^{-5} \text{ cm}$  and of refractive index 1.33. Which wavelength in the visible region will be reflected most strongly ? 7
4. (a) What is Holography ? Explain the construction and reconstruction of hologram. 8
- (b) Calculate the numerical aperture and hence the acceptance angle for an optical fibre given that refractive indices of the core and the cladding are 1.45 and 1.40 respectively. 7
5. (a) Explain various stages of Hysteresis curve and give the significance of Hysteresis. 8
- (b) How many orders will be observed by grating having 4000 lines per cm, if it is illuminated by light of wavelength in the range  $5000 \text{ A}^\circ$  to  $7500 \text{ A}^\circ$ . 7

6. (a) Show that electron can not pre-exist in free state in a nucleus. **8**
- (b) A magnetic material has magnetizing force  $198 \text{ A/m}$  and magnetization of  $2300 \text{ A/m}$ , find – (i) Corresponding flux density (ii) Relative permeability  
(Given  $\mu_0 = 4\pi \times 10^{-7}$ ). **7**
7. (a) Give the applications of the following instruments UV, IR, NMR and Microscopy ? **8**
- (b) Explain the construction and working of Pirani gauge. **7**