

**N.B. :** (1) Question No. 1 is **compulsory**.

(2) Attempt any **four** questions from question Nos. 2 to 7.

(3) **Figures** to the **right** indicate **full** marks.

13/12/08

RC-5567

F.E. Sem 2 (Rev.)

Applied Physics - II

15

1. Solve any **five** :-

All branches

- Find out similarities and dissimilarities between Newton's Ring and Wedge Shaped Experiment ?
- Why gases used as novel medium for laser ? How do you create meta stable in laser medium ?
- Give the relevance of quantum mechanics in lasers, magnetism and Bio-physics ?
- Distinguish between X-ray Diffraction (XRD) and Light-ray diffraction ?
- What is meant by path difference ? What are its different conditions ? Give its importance ?
- What is optical fiber ? List out the advantages of an optical fiber ?
- State and explain Heisenberg's uncertainty principle ?

2. (a) Prove that the  $n^{\text{th}}$  dark ring of Newton's Ring is directly proportional to square root of ring number ? 5

(b) How lasers are different than X-rays ? Explain the following terms of laser science : 10  
(i) Induced Absorption (ii) Spontaneous Emission (iii) Stimulated Emission  
(iv) Meta stable state and (v) Population inversion.

3. (a) A light of wave length  $5500 \text{ \AA}$  incident on thin transparent denser medium having refractive index 1.45. Determine the thickness of thin medium if the angle of refraction is  $45^\circ$  (consider  $n = 1$ ). 5

(b) Explain the concept of molecular laser. 5

(c) What is Bio-physics ? How it is co-related to the Atomic Absorption Spectroscopy (AAS) ? List out the instruments involved in this branch ? 5

4. (a) What is the importance of vacuum medium ? Differentiate between diffusion and Rotary pump ? 7

(b) What is Holography ? Give its construction and advantages over photographic technique. 8

5. (a) What is the effect of temperature on paramagnetic materials ? Explain the relation of temperature and magnetic property for the same. 7

(b) With neat sketch explain principle, construction, energy diagram and specificity of Nd : YAG laser. 8

6. (a) Derive an expression for Numerical Aperture of an optical fiber belongs to step index type. 7

(b) What is meant by diffraction grating ? How it is useful for determination of wavelength of mono-chromatic source ? 8

7. (a) If an electron is accelerated at potential  $V$ , find out the wavelength of matter wave ? Give its importance ? 5

(b) A metal ring having cross-section area  $5 \text{ cm}^2$  with its diameter 20 cm has a coil of 200 turns wound over it. Determine the reluctance and current required to produce flux of 2 milliweber ( $\mu_r = 380$ , neglect air gap). 5

(c) How Newton's Ring experiment is useful to determine Refractive Index of liquid medium ? Explain ? 5