

(i) Printed Pages : 3 Roll No. ....

(ii) Questions : 7 Sub. Code : 

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Exam. Code : 

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**Bachelor of Science (FYUP) 3<sup>rd</sup> Semester  
(2125)**

**PHYSICS**

**Paper : Optics And Lasers**

**Time Allowed : Three Hours] [Maximum Marks : 60**

- Note :—** (1) Attempt **five** questions in all, selecting **two** questions from each Unit I-II.
- (2) Unit III is compulsory.
- (3) Use of non-programmable scientific calculator is allowed.

**UNIT—I**

1. (a) What are the necessary conditions for sustained interference of light waves? Describe Young's Double-Slit Experiment setup and procedure. Derive the expression for the resultant intensity at an arbitrary point on the screen, and obtain the formula for the fringe width in this experiment. 9
- (b) A sodium atom radiates for  $4 \times 10^{-12}$ s. What is the coherence length of light from a sodium lamp? 3

2. (a) What is a zone plate? What is the difference between positive and negative zone plate? 9
- (b) Two pin holes 1.5 mm apart are placed in front of a source of light of wavelength  $5.5 \times 10^{-5}$  cm and seen through a telescope with its objective stopped down to a diameter of 0.4 cm. Find the maximum distance from the telescope at which the pin holes can be resolved. 3
3. (a) What is double refraction? How will you get elliptical polarised light? 9
- (b) Two Nicol prisms are set so that maximum light is transmitted. Through what angle should one of the prisms be rotated to reduce the intensity to one half? 3

## UNIT—II

4. (a) What is population inversion? Explain why Laser action cannot occur without population inversion between atomic levels and how it is achieved in Laser. 9
- (b) Explain the terms: Coherence length, spatial coherence and temporal coherence. 3
5. (a) Discuss with suitable diagram, the principle, construction and working of Ruby Laser. What are its advantages? 9
- (b) Find the ratio of populations of the two states in a He-Ne laser that produces light of wavelength  $6328\text{\AA}$  at  $27^\circ\text{C}$ . 3

6. (a) Describe optical fibre and its construction. Explain the terms critical angle, acceptance angle and numerical aperture of an optical fibre. 9
- (b) Explain the concept of Holography. 3

### UNIT—III

7. Attempt all six parts :

- (i) How does the interference pattern by reflection in thin films differ from that by refraction?
- (ii) Why diffraction cannot be observed in daily life?
- (iii) Light waves can be polarized while sound waves cannot be. Why?
- (iv) Explain the principle of Feby Perot Interferometer.
- (v) Define skip distance of optical fibre.
- (vi) Is it possible to have two level lasers? Explain.

$$6 \times 2 = 12$$