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Reg. No. : .....

Code No. : 20349 E Sub. Code : EMPH 41

B.Sc. (CBCS) DEGREE EXAMINATION,  
NOVEMBER 2025.

Fourth Semester

Physics – Core

OPTICS AND LASER PHYSICS

(For those who joined in July 2023 onwards)

Time : Three hours

Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

1. The combined focal power of two thin lenses of focal lengths  $f_1$  and  $f_2$  in contact is
- (a)  $\frac{f_1 f_2}{f_1 + f_2}$                       (b)  $\frac{f_1 + f_2}{2}$
- (c)  $\frac{f_1 + f_2}{f_1 f_2}$                       (d)  $f_1 f_2$

2. The condition for achromatism for two lenses in contact is \_\_\_\_\_.

(a)  $\frac{w_2}{w_1} = \frac{-f_2}{f_1}$                       (b)  $\frac{w_1}{w_2} = \frac{-f_2}{f_1}$

(c)  $\frac{w_1}{w_2} = \frac{-f_1}{f_2}$                       (d)  $\frac{w_1}{w_2} = \frac{f_2}{f_1}$

3. Coherent light waves have

- (a) the same wavelength  
(b) same amplitude  
(c) same phase  
(d) all the above

4. Colours of thin films of oil seen on the road during rainy season are due to

- (a) Interference  
(b) Diffraction  
(c) Polarization  
(d) Total internal reflection

5. The incident rays are parallel is \_\_\_\_\_.

- (a) Fresnel diffraction
- (b) Frannhofer diffraction
- (c) Polarization
- (d) Interference

6. The formula used in normal incidence grating is \_\_\_\_\_.

- (a)  $\sin \theta = nN\lambda$
- (b)  $\cos \theta = nN\lambda$
- (c)  $2\sin \theta = nN\lambda$
- (d)  $2\sin\left(\frac{\theta}{2}\right) = nN\lambda$

7. Polarization of light proves

- (a) corpuscular nature of light
- (b) quantum nature of light
- (c) transverse nature of light
- (d) longitudinal nature of light

8. Quarter wave plate introduces a path difference \_\_\_\_\_.

- (a)  $\frac{\lambda}{2}$
- (b)  $\frac{\lambda}{4}$
- (c)  $\lambda$
- (d)  $2\lambda$

9. Which of the following is not a characteristics of laser?

- (a) coherence
- (b) light divergence
- (c) highly directional
- (d) extreme brightness

10. The wavelength of He-Ne laser is \_\_\_\_\_.

- (a) 632.8 nm
- (b) 700 nm
- (c) 589.4 nm
- (d) 432.8 nm

PART B — (5 × 5 = 25 marks)

Answer ALL questions, choosing either (a) or (b).

Each answer should not exceed 250 words.

11. (a) What are the methods of minimizing spherical aberration?

Or

(b) Obtain an expression for chromatic aberration of lens in terms of dispersive power.

12. (a) Write a note on colours of thin films.

Or

(b) Write a short notes on the 'formation of coherent sources' and give the 'conditions for interference'.

13. (a) Compare Fresnel and Frannhofer diffraction.

Or

(b) Write a short notes on 'Zone plate'.

14. (a) Describe with neat sketch, the construction of Nicol prism.

Or

(b) Describe the methods of production and defection of plane polarized light.

15. (a) What are the applications of laser?

Or

(b) Write a short notes on 'Holography'.

PART C — (5 × 8 = 40 marks)

Answer ALL questions, choosing either (a) or (b).

Each answer should not exceed 600 words.

16. (a) Derive the condition for dispersion without deviation produced by the combination of two prism.

Or

(b) Find the condition for achromatic combination of two lenses out of contact.

17. (a) What are the conditions for interference? Derive the condition for constructive and destructive interference?

Or

(b) What is air-wedge? Give the theory for the determination of diameter of a thin wire.

18. (a) Describe Fresnel's explanation of rectilinear propagation of light.

Or

(b) Give the theory of plane transmission gratation.

16. (a) Describe the construction and working of  
a simple microscope.

(1)

(b) Describe the process of construction of  
a simple microscope with a neat diagram.

17. (a) Describe the construction and working of  
a telescope with a neat diagram.

(1)

(b) Describe the method of construction and  
working of a telescope with a neat diagram.

18. (a) Describe the construction and working of  
a simple microscope.