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**Reg. No. : .....**

**Code No. : 30558 E      Sub. Code : SMPH 22**

B.Sc. (CBCS) DEGREE EXAMINATION,  
NOVEMBER 2020.

Second Semester

Physics — Core

**OPTICS**

(For those who joined in July 2017 onwards)

Time : Three hours

Maximum : 75 marks

**PART A — (10 × 1 = 10 marks)**

Answer ALL questions.

Choose the correct answer :

1. The field of view Huygen's eyepiece is \_\_\_\_\_  
than Ramsden eyepiece.  
(a) greater                      (b) smaller  
(c) equal                        (d) none
2. In an aplanatic lens \_\_\_\_\_ is minimum.  
(a) astigmatism  
(b) coma  
(c) spherical aberration  
(d) none

3. Interference is due to superposition of \_\_\_\_\_ waves.
- (a) incoherent                      (b) coherent  
(c) scattered                      (d) bending
4. The path difference for destructive interference is \_\_\_\_\_
- (a)  $(2n+1)\lambda/2$                       (b)  $n\lambda$   
(c)  $2n\lambda/3$                       (d) none
5. A zone plate forms \_\_\_\_\_ image.
- (a) real                      (b) virtual  
(c) real and virtual                      (d) none
6. In a fresnel diffraction, the incident waves are \_\_\_\_\_ waves.
- (a) plane                      (b) spherical  
(c) elliptical                      (d) none
7. A quarter wave plate produces a phase difference of \_\_\_\_\_
- (a)  $\pi$                       (b)  $\pi/2$   
(c)  $\lambda/2$                       (d) none

8. The acceptance angle ( $\Phi_{\max}$ ) is equal to \_\_\_\_\_ (NA is the numerical aperture)
- (a)  $\sin(NA)$                       (b)  $\sin^{-1}(NA)$
- (c)  $\cos^{-1}(NA)$                       (d) none
9. The output from a laser source is \_\_\_\_\_
- (a) highly coherent      (b) less intense
- (c) highly scattered      (d) none
10. The efficiency of CO<sub>2</sub> laser is around \_\_\_\_\_
- (a) 100%                      (b) 40%
- (c) 10%                      (d) zero

PART B — ( $5 \times 5 = 25$  marks)

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

Each answer should not exceed 250 words.

11. (a) What is coma? How it is eliminated?

Or

- (b) What is an eye piece? What is its advantage over single lens.

12. (a) Give the basic conditions for the interference of light.

Or

- (b) Explain the testing of plainness of surfaces.

13. (a) Distinguish between Fresnel and Fraunhofer diffractions.

Or

- (b) What is a zone plate? How does it differ from a convex lens?

14. (a) Distinguish between quarter wave plate and half wave plate.

Or

- (b) What are the characteristics of optical fiber?

15. (a) Give any five applications of laser.

Or

- (b) Explain the process of recording and reconstruction of a three dimensional images.

PART C — ( $5 \times 8 = 40$  marks)

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

Each answer should not exceed 600 words.

16. (a) Define dispersive power. Derive the condition to produce dispersion without deviation.

Or

- (b) Explain the construction and working of Huygens eyepiece.

17. (a) Give the theory of Newton's rings. Determine the radius of curvature of a lens using it.

Or

- (b) Describe Michelson interferometer. How it is used to measure the wavelength of light?

18. (a) Derive the expression for the resolving power of a grating.

Or

- (b) Explain the construction of Fresnel's half period zones.

19. (a) Discuss in detail the production and detection of circularly polarized light.

Or

- (b) Classify the fibers on the basis of
- (i) refractive index
  - (ii) number of modes
  - (iii) materials.

20. (a) Derive the Schallow and Townes equations for threshold condition for laser action.

Or

- (b) Describe the construction and working of CO<sub>2</sub> laser.
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