



K22U 1735

Reg. No. : .....

Name : .....

IV Semester B.Sc. Degree (CBCSS – Supplementary) Examination, April 2022  
(2016-18 Admissions)  
CORE COURSE IN PHYSICS  
4B04PHY : Optics

Time : 3 Hours

Max. Marks : 40

**Instruction** : Write answers in **English** only.

SECTION – A

Answer **all** questions. Very short answer type. **Each** carries 1 mark :

1. For a system matrix S,  $\det S =$  \_\_\_\_\_
2. A soap bubble appears multicolored in white light due to \_\_\_\_\_
3. In an N slit diffraction pattern, when N increases, the angular width of principal maxima \_\_\_\_\_
4. \_\_\_\_\_ phenomenon of light proves the transverse wave nature of light. **(4×1=4)**

SECTION – B

Answer **any seven** questions. Short answer type. **Each** carries 2 marks :

5. Write down the expression for the translation matrix and explain the symbols.
6. Explain the phenomenon of color of thin films.
7. How will you determine the refractive index of a liquid by Newton's ring experiment ?
8. What is an interferometer ?
9. What are Fresnel's half period zones ? Why are they called so ?
10. Compare a zone plate and a convex lens.
11. State and explain grating law.
12. Explain the double refraction phenomenon.
13. What is a quarter wave plate ? What is its use ?
14. Explain how elliptically polarized light can be produced. **(7×2=14)**

P.T.O.



## SECTION – C

Answer **any four** questions. Short essay/problem. **Each** carries **3** marks :

15. Two thin lenses of focal length 10 cm and 30 cm separated by a distance of 20 cm in air. Determine the system matrix and hence find the effective focal length.
16. In the Newton's rings experiment, the radius of curvature of the curved surface is 50 cm. The radii of the 9<sup>th</sup> and 16<sup>th</sup> dark rings are 0.18 cm and 0.2235 cm respectively. Calculate the wavelength.
17. Derive a condition for the missing orders of interference maxima in double slit Fraunhofer diffraction pattern.
18. The radius of the first zone on the zone plate is 0.05 cm. A plane wave front of light of wavelength  $\lambda = 5000 \text{ \AA}$  is incident on it. Find the distance of the screen from the zone plate so that the light is focused to bright spot.
19. Show that areas of half period zones are equal.
20. Calculate the thickness of ice required to act like a half wave plate for a wavelength of 590 nm. Given  $\mu_e = 1.313$  and  $\mu_o = 1.309$ . **(4×3=12)**

## SECTION – D

Answer **any two** questions. Long essay type. **Each** carries **5** marks :

21. Derive an expression for the conditions of brightness and darkness produced under oblique incidence of light on a plane film producing interference due to reflected light.
  22. Discuss in detail Fraunhofer diffraction due to a single slit.
  23. Explain the rectilinear propagation of light on the basis of Fresnel half period zones.
  24. What is meant by double refraction ? Give Huygen's explanation of double refraction. **(2×5=10)**
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