K21U 2100

Reg. No. : ....

Name : ....

III Semester B.Sc. Degree (CBCSS – Sup./Imp.)
Examination, November 2021
(2015 – '18 Admissions)
COMPLEMENTARY COURSE IN PHYSICS
3C03 PHY : Optics and Photonics

Time : 3 Hours | Max. Marks : 32

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

SECTION – A

Very short answer type. **Each** carries **1** mark. Answer **all 5** questions.

1. SI unit for Einstein coefficient A is ________.
2. Path difference produced by a uniform glass slab of refractive index n and thickness t to a light is ________.
3. With light of wavelength λ, an air wedge of angle θ produces interference fringes of fringewidth β = ________.
4. A plane polarized light from a polarizer has intensity I. When it passes through an analyzer arranged with its plane held at 60° with respect to the plane of polarizer, the intensity of the resulting light beam is ________.
5. A plane wavefront of light of wavelength λ is found have a second Fresnel zone with area A, as seen from a point P. The distance to the wavefront from the point P is ________.

SECTION – B

Short answer type. **Each** carries **2** marks. Answer **any 4** questions.

6. State the condition for maxima and minima of interference for a monochromatic light of wavelength λ.
7. In double refraction of light, explain what is an extraordinary.

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8. How does a Fraunhoffer type diffraction differ from the Fresnel type ?
9. What is dispersive power of a grating ?
10. By plotting its graph, display how the intensity varies with the distance from the central maximum for a diffraction pattern due to a single slit.
11. What are Stokes and anti-Stokes lines in Raman effect ?

SECTION – C

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

12. Provide the quantum mechanical explanation for Raman effect.
13. A quarter wave plate of thickness 0.016 mm is placed in front of light of wavelength 400 nm. Find the difference between the principal refractive indices for ordinary and extraordinary rays.
14. Explain the conditions to obtain elliptically, linearly and circularly polarized light by superposition of ordinary and extraordinary rays.
15. In a Newton's rings arrangement with radius of curvature 50 cm, the radii of the 9^{th} and 16^{th} dark rings are 0.18 cm and 0.2235 cm respectively. Find the wavelength.
16. A plane transmission grating produces a diffraction pattern with the second maximum for light of wavelength 440 nm at an angle of diffraction 32°. Find the number of rulings per centimeter on the grating.

SECTION – D

Long essay type. **Each** carries **5** marks. Answer **any 2** questions.

17. Explain spontaneous and stimulated emission and derive an expression for the ratio of Einstein's coefficients.
18. Explain diffraction at a straight edge due to monochromatic light and arrive at expressions for the intensities of first maximum, first minimum and second maximum.
19. Derive the condition for maxima and minima in interference due to reflection on a thin film of uniform thickness.
20. Explain the construction of a optical fibre and propagation of light in it. What are numerical aperture and angle of acceptance ?
