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DCPH301

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III Semester B.Sc. Degree Examination, February/March - 2024

PHYSICS

Wave Motion and Optics

(NEP Scheme Freshers + Repeaters 2021-22 Onwards)

Paper : PHY. DSCT3



Time : 2½ Hours

Maximum Marks : 60

Instructions to Candidates:

1. Answer the number of questions as cited in each part.
2. Non - programmable scientific calculators are allowed.

PART - A

Answer any FOUR questions. Each question carries 2 marks.

(4×2=8)

1. Mention any two characteristics of a wave motion.
2. What are stationary waves? Mention the condition for the formation of stationary wave
3. Mention any two conditions for good acoustical design of an auditorium.
4. What are coherent sources? Mention any one method of producing coherent sources.
5. Distinguish between Fresnel's and Fraunhofer diffraction.
6. Mention any two methods of producing plane polarized light.

PART - B

Answer any FOUR questions. Each question carries 5 marks.

(4×5=20)

7. The displacement of a wave is given by $y = 10^{-5} \sin 2\pi (7000t - 20x)$ m. Find the intensity of the progressive wave in a fluid of density 1.25 kgm^{-3} .
8. Calculate :
 - a) The velocity
 - b) The wavelength of the longitudinal waves of frequency 500 Hz in a rod of material of density $5 \times 10^3 \text{ kgm}^{-3}$ and Young's modulus $8 \times 10^{10} \text{ Nm}^{-2}$.

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9. Find the reverberation time of a room which has a volume of 1000 m^3 and a total sound absorption of 70 metric sabine. What is the additional sound absorption required for an optimum reverberation time of 2 s?
10. Interference fringes are produced by a biprism in the focal plane of a reading microscope at a distance of 1m from the slit. On introducing the lens between the biprism and the microscope, separation between magnified and diminished images are found to be 4.05mm and 2.90 mm respectively. If the wavelength of the light is 5893 \AA , find the fringe width.
11. An air wedge of length 5 cm is formed between two glass plates. When viewed in green light of wavelength 5461 \AA , 15 fringes are seen in a space of 5 mm. Calculate the thickness of the object placed in the air wedge.
12. Calculate the thickness of a half wave plate for $\lambda = 5461 \text{ \AA}$. Given : the refractive indices of the medium for the O-ray and E- ray are 1.586 and 1.592 respectively.

PART - C

Answer any FOUR questions. Each question carries 8 marks.

(4×8=32)

13. a) Derive an expression for intensity of plane progressive wave.
b) What are Lissajous figures? Mention any two uses. (5+3)
 14. Derive an expression for velocity of longitudinal waves in gaseous medium. (8)
 15. a) Discuss the modes of vibrations of air in a closed pipe.
b) Explain the acoustic intensity level and acoustic pressure level of sound. (4+4)
 16. Give the theory of Newton's rings by reflected light and hence obtain the condition for bright and dark fringes. (8)
 17. a) Derive an expression for the resolving power of a grating.
b) What is a zone plate? Distinguish between zone plate and convex lens. (3+5)
 18. a) What is optical activity? Write the expression for specific rotation of a solution.
b) Describe the construction and working of a Laurent's half shade polarimeter. (2+6)
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