2022/TDC (CBCS)/EVEN/SEM/ PHSDSC/GE–401T/116

TDC (CBCS) Even Semester Exam., 2022

PHYSICS

(4th Semester)

Course No. : PHSDSC/GE–401T

(Waves and Optics)

Full Marks : 50

Pass Marks : 20

Time : 3 hours

The figures in the margin indicate full marks for the questions

SECTION—A

Answer any *fifteen* of the following questions :

1×15=15

1. How are force and displacement related in harmonic oscillations?

2. Can we consider the oscillations of a liquid in a U-tube as simple harmonic oscillations?

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(2)

3. Define time period of a harmonic oscillation.

4. What is frequency of harmonic oscillations?

5. Is sound a transverse wave?

6. Define group velocity in wave motion.

7. How is acceleration related with displacement in simple harmonic motion?

8. Write the Sabine's formula.

9. Is light an electromagnetic wave?

10. Define wavefront.

11. What is interference of light?

12. Give the value of refractive index of a medium with respect to vacuum.

13. Can we use Michelson interferometer for the determination of wavelength of a monochromatic light?

14. What is diffraction of light?

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15. What type of diffraction we observe in single-slit when both the source and the point of observation are effectively at infinite distance from the slit?

16. What is Fresnel diffraction?

17. Is light a transverse wave?

18. What is the phase difference introduced between O-ray and E-ray by a quarter-wave plate?

19. What is the the path difference introduced between O-ray and E-ray by a half-wave plate?

20. What is plane polarized light?

SECTION—B

Answer any *five* of the following questions :   2×5=10

21. State the superposition principle for two collinear harmonic oscillations.

22. What are Lissajous figures?

23. What do you mean by forced vibrations and resonance?

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24. Define reverberation and time of reverberation.

25. State Huygens' principle.

26. What do you mean by division of amplitude and division of wavefront?

27. State the differences between Fresnel diffraction and Fraunhofer diffraction.

28. What do you mean by half-period zones?

29. Distinguish between polarized and unpolarized light.

30. State the production of plane polarized light by Nicol prism.

SECTION—C

Answer any *five* of the following questions :   5×5=25

31. Explain how beats are formed due to the superposition of two collinear harmonic oscillations having different frequencies.

32. Derive the expression for the resultant motion obtained from the superposition of two perpendicular harmonic oscillations having same period but different amplitude and phases.

(Continued)

(5)

33. Derive the expression for velocity of transverse waves on a string.

34. What do you mean by intensity and loudness of sound? Write the acoustic aspects of a good auditorium.   3+2=5

35. Describe Young's double-slit experiment and obtain an expression for fringe width.

36. Describe the Newton's ring method for measuring the wavelength of monochromatic light.

37. Describe the construction and working principle of Michelson interferometer.

38. What is a zone plate? State how it behaves like a convex lens.

39. Give the construction and working principle of a Nicol prism.

40. Describe the construction and action of a Babinet's compensator.

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