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B.M.S COLLEGE FOR WOMEN, AUTONOMOUS
BENGALURU – 560004

SEMESTER END EXAMINATION – MARCH/APRIL-2023

B.Sc PHYSICS - III Semester
WAVE MOTION AND OPTICS

Course Code: PHY3DSC03

Duration: 2 ½ Hours

QP Code: 3013

Max marks: 60

Instructions: Answer any FOUR questions from each part.

PART - A

I. Answer any FOUR questions out of SIX. Each question carries 8 marks. (4X8=32)

1. What are Lissajous figures? Explain the superposition of two perpendicular harmonic oscillations of equal frequencies. (1+7)
2. Derive energy density expression for transverse wave along a stretched string. (8)
3. a. Define reverberation time? Derive Sabine reverberation formula.
b. Give an account of Ripples and Gravitational waves. (4+4)
4. Give the theory of Fresnel's biprism and obtain an expression for fringe width of interference fringes.
b. Mention two methods of obtaining coherent sources. (6+2)
5. a. Write an expression for path difference in reflected light from air wedge. Hence derive an expression for fringe width.
b. Mention any two similarities and dissimilarities between convex lens and zone plate. (4+4)
6. a. What are retarding plates? How can circularly polarized light be produced and detected?
b. Define optical activity. What are dextrorotatory and laevorotatory substances? (5+3)

PART-B

II. Answer any FOUR problems out of SIX. Each question carries 5 marks. (4X5=20)

1. The equation of progressive wave is $y = 0.2\sin(100\pi t - 0.08\pi x)$ where x and y are in meter, t is in seconds. Find the amplitude, frequency, wavelength and velocity of the wave.
2. Two tuning forks P and Q produce 6 beats. P resonates with a closed column of air 15cm long and Q with an open column 30.5 cm long. Calculate the frequencies of P and Q.
3. For an empty auditorium of size $(20 \times 15 \times 12) \text{ m}^3$ with absorption coefficient 0.102, calculate the reverberation time.

4. In Newton's ring experiment, the diameter of 6th ring is 0.25cm and that of 26th ring is 0.75cm, if the wavelength used is 5893 Å. Find the radius of curvature of lens used.
5. How many half-period elements are contained in a circular hole of radius 1 mm for a zone plate of focal length 0.450m? Given wavelength of light = 5890 Å.
6. In a biprism experiment a fringe width of 1.8mm is obtained when the double slit of width 0.5mm is at a distance of 2m from the screen. Find the wavelength of light used.

PART-C

III. Answer any FOUR questions out of SIX. Each question carries 2 marks. (4X2=8)

1. Do gravitational waves travel at the speed of sound?
2. What is the period of oscillation of a simple pendulum, if its bob is made of ice?
3. Reverberation time in an empty hall is larger than a crowded hall. Justify.
4. Can any two observers see the same colour through a given point in an oil film? Explain.
5. Can interference fringes be produced by two separate lighted candles or electric bulbs? Explain.
6. Optical transmission grating cannot be used to study X-ray diffraction. Justify
