B.M.S COLLEGE FOR WOMEN
BENGALURU – 560004

III SEMESTER END EXAMINATION – JAN/FEB - 2024

B.Sc -Physics: WAVE MOTION AND OPTICS

Course Code: PHY3DSC03 **QP Code:3013**
Duration: 2 ½ Hours **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. Obtain the expression for superposition of two perpendicular harmonic oscillations having equal frequencies & hence obtain an expression for straight line motion.   (8)

2. Derive an expression for harmonics in the case of closed organ pipe.   (8)

3. a) Write a note on any of three factors affecting acoustics in buildings.
   b) Derive differential equation of wave motion.   (3+5)

4. Obtain an expression for fringe width in Young's double slit experiment and conditions for constructive and destructive interference.   (8)

5. a) Derive a relationship between focal length and radius of zone plate.
   b) Define Rayleigh criteria for resolving power.   (6+2)

6. a) Explain polarization by reflection.
   b) Prove that $\alpha = \tan\alpha$ in case of Fraunhoffer diffraction.   (2+6)

Part-B

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

7. A wave travelling in +x direction is given by $y = 4 \sin 2\pi \left(\frac{t}{20} - \frac{x}{400}\right)$. Find its amplitude, linear velocity and angular velocity.

8. Transverse wave with speed of 50 ms^{-1} are to be produced in a string. A 5m length of the string with a mass of 0.06 kg is used. Find the tension in the string.

9. A hall with dimensions 30 x 20 x 15 m³ is found to have a reverberation time 5 s. What is the total absorbing power of all the surfaces in the hall?

10. Two coherent sources whose intensity ratio 81:1 produce interference fringes. Calculate the ratio of intensity of maxima and minima in the fringe system.

11. In an experiment with straight edge diffraction the slit to straight edge is 1m and straight edge to screen is 2m. If the slit is illuminated by the light of wavelength 500nm, calculate the separation between first and third bright fringes.

12. Calculate the specific rotation if the plane of polarization is turned through 25°, traversing 0.2m length of 150 kgm⁻³ sugar solution.

Part-C

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

   13. Are periodic motions oscillatory?

   14. Sound produced in air is not heard by a person in water. Why?

   15. Reverberation time should not be too large nor too small. Justify.

   16. Bubbles of colourless soap solution appear coloured in sun light. Why?

   17. Diffraction is common in sound but not in light waves. Why?

   18. Can sound waves be polarized? Explain.

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