2017

(2nd Semester)

PHYSICS

SECOND PAPER

(Oscillations, Acoustics and Optics)

(Pre-revised)

Full Marks : 55

Time : 2½ hours

(PART : B—DESCRIPTIVE)

(*Marks* : 35)

The figures in the margin indicate full marks for the questions

1. Derive the differential equation of simple harmonic motion and hence obtain the solution. 2+5

Or

Two simple harmonic motions $x \quad A\sin(\ t\ \ )$ and $y \quad B\sin\ t$ superposed each other at right angle. Obtain the general equation for the resultant simple harmonic motion after they superposed each other and hence discuss the case when—

(a) $\frac{}{2}$;

(b) . 5+1+1

2. Write the differential equation for free undamped vibration. Hence obtain the solution. What happens to the amplitude of the vibration? 1+5+1

Or

Explain the production of ultrasonic wave by piezoelectric method. Write down any three uses of ultrasonic wave. 4+3

3. Deduce the condition for achromatism of two thin lenses separated by small distance *d*. 7

Or

(a) By the concepts of cardinal points in thick lens, answer the following questions :

(i) How many refractions take place for a single light ray when passing through the lens?

(ii) In which plane does refraction take place?

(iii) What is the advantage of the concepts of cardinal points over the idea of considering refractions at each surface of the lens? 1+1+1

(b) Show that the nodal points and principal points in a thick lens coincide, if the refractive indices are same on either sides of the lens. 4

4. Discuss the basic theory of interference of light. Show that the condition for constructive interference is $2n$, where is phase difference between the two light waves. 3+4

Or

Discuss the theory of Newton's ring. How do you determine the wavelength of light with the help of Newton's ring? 4+3

5. Answer the following questions : 1+2+1+3

(a) What do you mean by double refraction?

(b) What are O-ray and E-ray in reference to double refraction?

(c) What is phase retardation plate?

(d) Discuss half-wave plate, mentioning its uses.

Or

Obtain the expressions for Einstein's A and B coefficients. 7

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Subject Code : PHY/II/02 (PR)

Booklet No. A

Date Stamp .....

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To be filled in by the Candidate

DEGREE 2nd Semester
(Arts / Science / Commerce / .....) Exam., **2017**

Subject .....

Paper .....

INSTRUCTIONS TO CANDIDATES

1. **The Booklet No. of this script should be quoted in the answer script meant for descriptive type questions and vice versa.**
2. **This paper should be ANSWERED FIRST and submitted within** *45 minutes* **of the commencement of the Examination.**
3. **While answering the questions of this booklet, any cutting, erasing, over-writing or furnishing more than one answer is prohibited. Any rough work, if required, should be done only on the main Answer Book. Instructions given in each question should be followed for answering that question only.**

To be filled in by the Candidate

DEGREE 2nd Semester
(Arts / Science / Commerce / .....) Exam., **2017**

Roll No. .....

Regn. No. .....

Subject .....

Paper .....

Descriptive Type

Booklet No. B .....

Signature of Scrutiniser(s)

Signature of Examiner(s)

Signature of Invigilator(s)

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(2nd Semester)

PHYSICS

SECOND PAPER

(Oscillations, Acoustics and Optics)

(Pre-revised)

(PART : A—OBJECTIVE)

(*Marks* : 20)

The figures in the margin indicate full marks for the questions

SECTION—A

(*Marks* : 5)

Tick (✓) the correct answer in the brackets provided : 1×5=5

1. The average kinetic energy of a particle of mass m, executing simple harmonic motion of frequency f, amplitude a, is

(a) $2\pi^2 ma^2 f^2$ ( )

(b) $\pi^2 ma^2 f^2$ ( )

(c) $\frac{\pi^2 ma^2 f^2}{2}$ ( )

(d) $\frac{\pi^2 ma^2 f^2}{\sqrt{2}}$ ( )

2. If b is the damping constant, ω is the natural frequency of the oscillating system, then the frequency of vibration is

(a) $\frac{\sqrt{\omega^2 - 2b^2}}{2\pi}$ ( )

(b) $\frac{\sqrt{\omega^2 - b^2}}{2\pi}$ ( )

(c) $\frac{\sqrt{\omega^2 + b^2}}{2\pi}$ ( )

(d) $\frac{\sqrt{\omega^2 + 2b^2}}{2\pi}$ ( )

3. The condition for achromatism of two lenses in contact is

(a) $\frac{\omega_1}{f_1} + \frac{\omega_2}{f_2} = 0$ ( )

(b) $\frac{\omega_1}{f_1} - \frac{\omega_2}{f_2} = 0$ ( )

(c) $\frac{\omega_1 \omega_2}{f_1 f_2} = 0$ ( )

(d) $\omega_1 f_1 + \omega_2 f_2 = 0$ ( )

4. In everyday life, diffraction of sound is observed whereas diffraction of light is not. This is due to the fact that

(a) sound is longitudinal in nature ( )

(b) wavelength of sound is very small ( )

(c) light is transverse in nature ( )

(d) wavelength of light is very small ( )

5. At Brewster's angle, the angle between the reflected light and refracted light is

(a) 60° ( )

(b) 120° ( )

(c) 90° ( )

(d) 45° ( )

SECTION—B

(*Marks* : 15)

Write very short answers to the following questions : 3×5=15

1. The displacement of a particle is given by

$$x = x_0 \sin \omega t$$

Show that it performs simple harmonic motion.

2. Define the following :

Melody ; Harmony ; Intensity of sound.

3. A light is incident on the glass surface. The reflected light becomes plane polarized. Calculate the polarizing angle and the angle of refraction. [Given— refractive index of glass = 1·54, $\tan^{-1}(1{\cdot}54) = 57°$]

4. Give the differences between Fresnel diffraction and Fraunhofer diffraction.

5. What is polarization of light? Why is only electric field considered, not the magnetic field of light in case of polarization?

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