

PHY/II/02 (PR)

2 0 1 6

(2nd Semester)

PHYSICS

SECOND PAPER

(Oscillations, Acoustics and Optics)

[2011–2013 Batch (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. What are Lissajous figures? Discuss the formation of Lissajous figures when the periods of the two vibrations are equal and phase difference is $\frac{\pi}{2}$. 1+6=7

Or

Show that the fundamental frequency of a stretched string is given by $n = \frac{1}{2l} \sqrt{\frac{T}{m}}$, where the symbols used have their usual meanings. 7

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(Turn Over)

(2)

2. Show that in forced vibration, the resultant amplitude is given by

$$A = \frac{f}{\sqrt{(n^2 - p^2)^2 + 4b^2 p^2}}$$

where f is external force per unit mass, n is natural angular frequency, b is damping coefficient and p is external angular frequency.

7

Or

Derive Sabine's reverberation formula and explain its significance.

5+2=7

3. Obtain the condition for achromatic combination of two thin lenses of the same material separated by a small distance. How is this condition realized in achromatic eyepieces for optical instruments?

5+2=7

Or

What are cardinal points? What are the functions of objective lens used in an eyepiece? Give the construction and working of a Huygens' eyepiece and calculate the positions of the cardinal points.

1+2+4=7

4. Discuss the theory of Newton's ring. On what factor does it depend? How can the wavelength of light be determined with the help of Newton's ring?

2+1+4=7

(3)

Or

What are Haidinger's fringes? Write down the construction and working of Michelson interferometer. Explain how it is used to determine wavelength of light.

1+4+2=7

5. Discuss Huygens' theory of double refraction. Explain the propagation of plane waves in a uniaxial crystal.

3+4=7

Or

Write a note on Einstein 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., **2016**

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., **2016**

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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PHY/II/02 (PR)

2 0 1 6

(2nd Semester)

PHYSICS

SECOND PAPER

(Oscillations, Acoustics and Optics)

[2011–2013 Batch (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 total energy of the particle executing simple harmonic motion is given by

(a) $\pi^2 m a^2 n^2$ ()

(b) $2\pi^2 m a^2 n^2$ ()

(c) $\pi^2 m a n$ ()

(d) $2\pi m^2 a^2 n$ ()

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(2)

2. The musical interval (the ratio between the frequencies of two notes) is

(a) less than 1 ()

(b) equal to 0 ()

(c) equal to or more than 1 ()

(d) negative ()

3. The condition for minimum spherical aberration is that the distance between the two lenses is

(a) equal to the difference in their focal lengths ()

(b) zero ()

(c) greater than the difference in their focal lengths ()

(d) smaller than the difference in their focal lengths ()

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(3)

4. For Fraunhofer diffraction at a single slit the width of the central maximum is

(a) proportional to λ^2 ()

(b) inversely proportional to λ^2 ()

(c) inversely proportional to λ ()

(d) proportional to λ ()

5. The specific rotation of the optically active substance is given by the expression

(a) $S'_\lambda = \frac{100c}{l}$ ()

(b) $S'_\lambda = \frac{100lc}{\theta}$ ()

(c) $S'_\lambda = \frac{100}{lc}$ ()

(d) $S'_\lambda = \frac{lc}{100}$ ()

(4)

SECTION—B

(Marks : 15)

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

1. Write a note on Chladni's figure.

(5)

2. Define (a) intensity and loudness of sound and (b) musical scale.

(6)

3. A biprism is placed 5 cm from a slit illuminated by sodium light ($\lambda = 5890 \text{ \AA}$). The width of the fringes obtained on a screen 75 cm from a biprism is $9.424 \times 10^{-2} \text{ cm}$. What is the distance between the two coherent sources?

(7)

4. Explain Rayleigh's criterion for resolution and determine the resolving power of a telescope.

(8)

5. Write a note on Faraday effect.

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