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( 2nd Semester )

PHYSICS

SECOND PAPER

( Oscillations, Acoustics and Optics )

( Revised )

Full Marks : 55

Time : 2½ hours

( PART : B—DESCRIPTIVE )

( Marks : 35 )

*The figures in the margin indicate full marks  
for the questions*

1. (a) Show that the total energy of a particle in simple harmonic motion is conserved. 3
- (b) Derive an expression for the time period of oscillation of a compound pendulum. 4

Or

What do you mean by standing waves? How are nodes and antinodes formed? Find an expression for normal modes of a standing wave.

7

2. Obtain the amplitude of vibration of a system vibrating under the influence of an external vibrating agency. When does resonance occur? Explain the term 'sharpness of resonance' and mention the factors on which it depends.

7

Or

Obtain the expression for the growth of energy density in an enclosure (room) of volume  $V$ .

7

3. (a) Using 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 refraction at each surface of the lens?  $1+1+1=3$
- (b) Show that in thick lens, nodal points and principal points coincide if the refractive indices are same on either side of the lens. 4

( 3 )

Or

What are aplanatic points and aplanatic surface? Discuss the principle of Abbe's homogeneous oil-immersion microscopic objective. 2+5=7

4. Discuss the basic theory of interference of light. Show that the condition for constructive interference is  $2n$ , where  $n$  is phase difference between the two light waves. 3+4=7

Or

Discuss the theory of Newton's ring. On what phenomenon does it depend? How can the wavelength of light be determined with the help of Newton's ring? 2+1+4=7

5. What is zone plate? Give the theory of zone plate. Show that a zone plate has multiple foci. 1+3+3=7

Or

- (a) Explain diffraction at  $N$  slits. 2
- (b) Give the theory of plane transmission grating and show how you would use it to determine the wavelength of light. 2+3=5

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Subject Code : PHY/II/02 (R)

Booklet No. **A**

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Date Stamp .....

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

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**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 .....

**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, overwriting 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.

Signature of  
Scrutiniser(s)

Signature of  
Examiner(s)

Signature of  
Invigilator(s)

**PHY/II/02 (R)**

**2 0 1 7**  
( 2nd Semester )

**PHYSICS**

SECOND PAPER

**( Oscillations, Acoustics and Optics )**

( Revised )

( PART : A—OBJECTIVE )

( Marks : 20 )

*The figures in the margin indicate full marks for the questions*

SECTION—I

( Marks : 5 )

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

**1.** Chladni's figures are vibration patterns formed in

- (a) vibrating strings ( )
- (b) vibrating membranes ( )
- (c) vibrating plates ( )
- (d) vibrating liquid surface ( )

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( 2 )

2. In forced vibrations, the quantity which measures sharpness of resonance is the

(a) amplitude ( )

(b) energy ( )

(c) quality factor ( )

(d) power of vibrating system ( )

3. A system of two thin convex lenses of focal lengths  $f_1$  and  $f_2$  are separated by a distance  $d$ , will behave as a

(a) convergent lens ( )

(b) divergent lens ( )

(c) plate ( )

(d) All of the above ( )

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( 3 )

4. For two sources to be coherent, it is essential that they must be

(a) monochromatic ( )

(b) multichromatic ( )

(c) independent ( )

(d) derived from same source and must be monochromatic ( )

5. If  $N$  is the number of rulings in the grating,  $n$  is the order of spectrum and  $\lambda$  is the wavelength of light used, the resolving power of grating  $\left(\frac{\lambda}{d\lambda}\right)$  is

(a)  $Nn\lambda$  ( )

(b)  $Nn$  ( )

(c)  $\frac{N\lambda}{n}$  ( )

(d)  $\frac{Nd\mu}{d\lambda}$  ( )

( 4 )

SECTION—II

( Marks : 15 )

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

1. Explain Chladni's figures.

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( 5 )

2. Explain what happens when a pulse of ultrasonic wave is impressed upon a piezoelectric crystal.

( 6 )

3. Mention three points of distinction between Huygens' eyepiece and Ramsden eyepiece.

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( 7 )

4. State and explain Brewster's law for polarization of light.

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( 8 )

5. Explain the difference between Fresnel diffraction and Fraunhofer diffraction.

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