PHYSICAL OPTICS (OPTICS – II) (SEMESTER - 2)

CS/B.OPTM/SEM-2/BO-201/09

1. ....
   Signature of Invigilator

2. ....
   Signature of the Officer-in-Charge

   Reg. No.

   Roll No. of the Candidate

- -

CS/B.OPTM/SEM-2/BO-201/09
ENGINEERING & MANAGEMENT EXAMINATIONS, JUNE – 2009
PHYSICAL OPTICS (OPTICS – II) (SEMESTER - 2)

Time : 3 Hours]   [Full Marks : 70

INSTRUCTIONS TO THE CANDIDATES :

1. This Booklet is a Question-cum-Answer Booklet. The Booklet consists of **32 pages**. The questions of this concerned subject commence from Page No. 3.
2. a) In **Group – A**, Questions are of Multiple Choice type. You have to write the correct choice in the box provided **against each question.**
   b) For **Groups – B** & **C** you have to answer the questions in the space provided marked 'Answer Sheet'. Questions of **Group – B** are Short answer type. Questions of **Group – C** are Long answer type. Write on both sides of the paper.
3. **Fill in your Roll No. in the box** provided as in your Admit Card before answering the questions.
4. Read the instructions given inside carefully before answering.
5. You should not forget to write the corresponding question numbers while answering.
6. Do not write your name or put any special mark in the booklet that may disclose your identity, which will render you liable to disqualification. Any candidate found copying will be subject to Disciplinary Action under the relevant rules.
7. **Use of Mobile Phone and Programmable Calculator is totally prohibited in the examination hall.**
8. You should return the booklet to the invigilator at the end of the examination and should not take any page of this booklet with you outside the examination hall, **which will lead to disqualification**.
9. Rough work, if necessary is to be done in this booklet only and cross it through.

No additional sheets are to be used and no loose paper will be provided
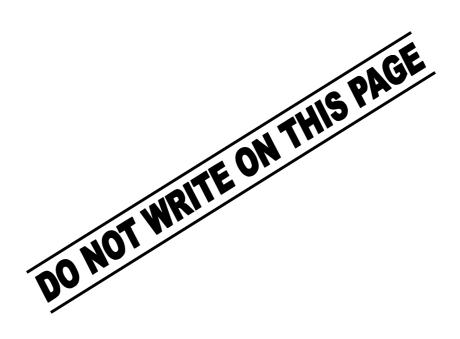
FOR OFFICE USE / EVALUATION ONLY
Marks Obtained

Question Number	Group – A										Group – B			Group – C			Total Marks	Examiner's Signature
Marks Obtained																		

....
Head-Examiner/Co-Ordinator/Scrutineer

2207 (03/06)

ENGINEERING & MANAGEMENT EXAMINATIONS, JUNE – 2009
PHYSICAL OPTICS (OPTICS – II)
SEMESTER – 2

Time : 3 Hours]   [Full Marks : 70

GROUP – A

(Multiple Choice Type Questions)

1. Choose the correct alternatives for the following : $10 \times 1 = 10$

   i) Which of the following phenomena proves the transverse nature of light ?

       a) Dispersion   b) Polarization

       c) Interference   d) Diffraction.

   ii) On reflection from a denser medium, the light undergoes a phase change of

       a) λ b) $\lambda/2$

       c) 2λ d) 3λ.

   iii) Product of wave velocity and time period is equal to

       a) frequency   b) wavelength

       c) amplitude   d) epoch.

   iv) In a simple harmonic motion, during the motion

       a) the kinetic energy is conserved

       b) the potential energy is conserved

       c) the total energy is conserved

       d) the amplitude is conserved.

   v) Light produced in a nicol prism is

       a) plane polarized   b) elliptically polarized

       c) circularly polarized   d) all of these.

vi)   In Fraunhoffer diffraction the incident wavefront is

    a)   plane polarized   b)   elliptically polarized

    c)   circularly polarized   d)   none of these.

vii)   The centre of Newton ring fringes in reflected light is

    a)   dark   b)   bright

    c)   white   d)   none of these.

viii)   Wave that cannot be polarized is

    a)   electromagnetic wave   b)   light wave

    c)   longitudinal wave   d)   transverse wave.

ix)   Laser is a device to produce

    a)   a beam of white light   b)   coherent light

    c)   microwaves   d) X-rays.

x)   The ratio of intensities of two waves is 9 : 1. If they interfere, the ratio of resulting maximum and minimum intensities will be

    a)   10 : 8   b)   9 : 1

    c)   4 : 1   d)   3 : 1.

GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following questions.   3 × 5 = 15

2.   Prove that in simple harmonic motion the total energy always remain conserved.   5

3.   a)   What is a hologram ?   2

    b)   How can you reconstruct the image from a hologram ?   3

4.   A biprism, placed 5 cm from a slit is illuminated by sodium light of wavelength 5890 Å. The width of the fringes obtained on a screen placed at a distance 75 cm from the biprism, is 9·424 × 10^{-2} cm. What is the distance between the two virtual sources ? 5

5. a) Distinguish between spontaneous and stimulated emission of radiation.   3

    b) State some applications of laser.   2

GROUP – C

(Long Answer Type Questions)

Answer any *three* of the following questions. $3 \times 15 = 45$

6. a) State the principle of superposition.   2

    b) State and explain Huygens principle of wave propagation.   3

    c) Prove the law of refraction at a spherical surface using Huygens principle.   5

    d) Two simple harmonic waves have equations :

    $y_1 = 16 \sin (4\pi t + \pi/6)$ cm and

    $y_2 = 8 \sin (5\pi t + \pi/4)$ cm

    What are their angular frequencies ? Find the ratio of their intensities.   3 + 2

7. a) State the basic conditions for obtaining permanent interference pattern.   3

    b) Find the conditions for constructive and destructive interferences.   5

    c) Why is the centre of Newton's rings for a reflected system dark ?   2

    d) The radii of the 5th and 15th dark rings are 0·336 cm and 0·590 cm respectively. The radius of curvature of the plano-convex lens is 100 cm. Find the wavelength of light used.   5

8. a) What do you mean by dual nature of light ?   2

    b) Obtain a relation between phase difference and path difference.   2

c) State and explain Brewster's law   4

d) Describe a Helium-Neon laser.   7

9. a) Explain the difference between Fresnel and Fraunhoffer diffraction phenomena.

3

b) Show that the intensity of first order secondary maximum in single slit diffraction pattern is nearly 4·5% of that of the principal maxima.   5

c) What do you mean by resolving power of an optical instrument ?   2

d) Write a short note on zone plate.   5

10. a) Distinguish between plane, circularly and elliptically polarised light.   3

b) Prove that the tangent of the polarization angle is equal to the refractive index of the medium.   4

c) Discuss the use of nicol prism as polarizer and analyser.   3 + 3

d) If refractive index of glass with respect to air is 1·5, find Brewster's angle.   2

END