Roll No. .....

Total No. of Questions : **9**] [Total No. of Printed Pages : **4**

(2034)

UG (CBCS) IInd Year Annual Examination

2805

B.Sc. PHYSICS

(Waves and Optics)

(DSC-1D)/Core

Paper : PHYS 202 TH

Time : 3 Hours] **[Maximum Marks : 50**

Note :– Attempt *five* questions in all, selecting *one* question each from Sections–B, C, D and E. Q. No. **1** (Section–A) is compulsory. Use of Non-programmable calculator is allowed.

Section–A

(Compulsory Question)

1. (i) What is meant by phase of oscillating particle ?

   (ii) What is the effect of damping on the natural frequency of an oscillator ?

(iii) Can a forced oscillator store energy ? Explain .

(iv) Define degrees of freedom.

(v) Why two wide slits cannot produce interference ?

(vi) The zone plate behaves like a :

(a) Convex lens

(b) Plane refracting surface

(c) Concave lens

(d) All of these

(vii) What changes on polarization of light ?

(a) Phase

(b) Intensity

(c) Wavelength

(d) Frequency

$2 \times 7 = 14$

Section–B

2. (a) Derive an expression for kinetic energy and potential energy of a simple harmonic oscillator.

(b) A SHM is characterised by $x = a \sin \omega t$. Calculate the displacement at which kinetic energy is equal to its potential energy.

4,5

3. Derive the equation of motion of damped simple harmonic oscillator and find its solution. Discuss light and critical damping. 9

Section–C

4. (a) Discuss the behaviour of displacement of a forced oscillator with driving force frequency.

   (b) Show that amplitude resonance occurs at a frequency which is slightly less than the natural frequency of the oscillator. 4,5

5. (a) Show that total energy of a coupled oscillator remains constant.

   (b) Show that there is no transmission of energy in a stationary wave. 4,5

Section–D

6. (a) Discuss Huygen's wave theory.

   (b) Discuss in detail the Young's double slit experiment. 2,7

7. Give the theory, experimental arrangement and method to determine wavelength of light by Newton's ring apparatus. 9

Section–E

8. (a) What is Zone plate ? Derive an expression for the area of the nth zone.

   (b) What will be the minimum number of lines on a grating which will just resolve in the second order lines whose wavelenghts are 5890 Å and 5896 Å ? 6,3

9. (a) Write short notes on the following :

   (i) Brewster's law

   (ii) Malus' law

   (iii) Nicol prism

   (b) Calculate the thickness of a half wave plate for light wavelength 6000 Å. Given $\mu_o = 1.55$ and $\mu_e = 1.45$. 6,3