(v) What happens to Newton's ring pattern if a monochromatic source of light is replaced by white light ?

(vi) The degrees of freedom of two simple pendulums attached by a spring are :

(a) 1 (b) 2

(c) 3 (d) 4

(vii) For a damped oscillator, product of logarithmic decrement and quality factor is equal to :

(a) Zero (b) 2π

(c) π (d) 3π [2×7=14]

Section–B

2. (a) Show that the total energy of simple harmonic oscillator is conserved.

(b) If the amplitude of an SHM is doubled. Find the corresponding change in :

(i) Time period

(ii) Maximum velocity

(iii) Maximum acceleration

(iv) Total energy [5,4]

3. (a) Derive the expression for average energy of a lightly damped harmonic oscillator.

(b) Define quality factor for a damped harmonic oscillator and deduce an expression for it. [5,4]

Section–C

4. (a) If the displacement of a forced oscillator is given by :

$$x = \frac{F_0}{\omega Z_0} \sin(\omega t - \phi)$$

then show that the displacement resonance occurs at a frequency ω which is slightly less than

$$\omega_0 = \sqrt{\frac{s}{m}}$$

the frequency of free oscillations.

(b) What do you understand by phase velocity and group velocity ? Under what conditions are they equal ? [5,4]

5. (a) Find the values of coupling constant in an electrical oscillator and discuss the coupling for loose and tight coupling.

(b) Define coupled oscillators, normal modes of vibration, normal coordinates and degree of freedom of the system. [5,4]

Section–D

6. (a) Describe the construction and working of Michelson's interferometer.

   (b) Explain the formation of interference fringes using Fresnel's biprism. Describe in detail how you would find the wavelength of a monochromatic source using a Fresnel's biprism. [5,4]

7. (a) Describe the principle, construction and production of interference fringes with Fabry-Perot interferometer.

   (b) Discuss Fraunhofer diffraction at a double slit. Derive an expression for intensity distribution and find the position of maxima and minima. [5,4]

Section–E

8. (a) Discuss diffraction at a plane diffraction grating and derive condition of secondary maxima and minima.

   (b) What is double refraction ? Discuss polarization by Nicol prism. [5,4]

9. (a) What do you mean by half period zones ? Write the factors upon which the amplitude of light waves forms a half period zone at the observation point depends.

   (b) Write short notes on the following :

   (i) Wire grid polarizer

   (ii) Malus Law [5,4]

Roll No. .....

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

(2096)

UG (CBCS) IInd Year (Suppl.) Examination

2092

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 from each Section–B, C, D and E respectively. Question No. **1** (Section–A) is compulsory.

Section–A

(Compulsory Question)

1. (i) What is grating element ?

   (ii) Write the condition for critical damping in case of an mechanical oscillator.

   (iii) What is force constant and what are its units ?

   (iv) Write the values of the amplitude and angular frequency for the simple harmonic wave $x = 0.55 \sin (200\ t - 0.8)m$.