10|10|2016 60

VCD F.Y. B.Sc. PHYSICS-II ATKT SEMESTER-I 2016-17 75 MARKS 2.30 HRS

Note: i) All the questions are compulsory.

ii) Figures to the right indicate full marks.

iii) Use of non programmable calculator is allowed.

Q.1] Answer the following: - **[20 Marks]**

A.a) Explain the refraction through a thick lens. Derive an expression for its focal length [8M]

OR

b) Give the theory 0f interference in thin flim. Derive an expression for the optical path difference . [8M]

B.a) What is the aberration of a lens? Explain why it arises in a lens. [7M]

OR

b) Explain the method to minimize the spherical aberration. [7M]

C.a) A thin planoconvex lens of focal length 2m and refractive index 1.5 is used to get newtons rings. Determine the radius of 10^{th} bright ring by refraction if the wedge shaped air flim is illuminated normally by a light of wavelength 589nm. [5M]

OR

b)Two convex lens of focal length 15cm and 10cm are at a distance 8cm apart. What is the power of a combination? [5M]

Q.2] Answer the following: - **[20 Marks]**

A. a) Give a brief account of application of laser. If a laser beam has a power of 30 mW, find the intensity of the spot. [8M]

OR

b) Explain recording of the hologram and state the basic technique of holography [8M]

B. a) What is numerical aperture (NA) of an optical fibre? Derive necessary expression for NA. [7M]

OR

b) Explain the light propagation through an optical fibre. [7M]

C. a) Write a short note on graded-index fibre. [5M]

OR

b) Give a brief account of application of laser. [5M]

[20 Marks]

Q.3] Answer the following: -

A.a) Derive Van der Waals equation explaining every step. [8M]

OR

b) Discuss the concept of Internal energy and obtain the first law of thermodynamics. [8M]

B. a) Show that the work done by a perfect gas in an adiabatic change is given by [7M]

$$W = nC_v(T_1 - T_2).$$

OR

b) What is critical coefficient? Show that its theoretical value is 2.667. [7M]

C. a) Show that Van der Waals equation can be written as : [5M]

$$(p_r + \frac{3}{V_r^2})(3V_r - 1) = 8T_r.$$

Where $p_r = \frac{p}{p_c}$, $V_r = \frac{V}{V_c}$ and $T_r = \frac{T}{T_c}$

OR

b) Discuss the path dependence of work. [5M]

Q.4] Answer the following. (Attempt any 3) **[15 Marks]**

a. Certain quantity of a perfect gas at NTP is compressed to one fourth of its large volume. Calculate the resulting pressure and temperature (r=1.4).

b. Discuss the limitations of Van der Waals equation.

c. Calculate the wavelength of light that incident normally on a wedge-shaped film of glass of R.I 1.47. The angle of wedge is 30 seconds of an arc and the fringe width is of the order 0.15 cm.

d. What are Lissagous figures? What factor do their shapes depend upon? A particle is subjected to two perpendicular SHM's $x = A\cos\omega t$

$y = A\cos(\omega t - \frac{\pi}{4})$ Find trajectory of the particle.

e. Explain properties of laser.

f. Fringes of same thickness are observed in a thin glass wedge of R.I 1.67. If the fringe spacing is 2 mm and wavelength of incident line 5890Å, what is the angle of wedge in seconds of an arc?

-x-x-x-x-x-x-x-x—x-x-x-x-xx-