

mal/10/15

Date - 13/10/15 F.Y.B.Sc

VCD 13/16/15 FYBSC

SEM-I

2015-2016

MARKS-75

TIME-2HRS 30 MIN

Sem I

NOTE: Figures to the right indicate full marks.

Non programmable calculators are allowed.

All questions are compulsory.

Q1) Answer the following.

(20M)

A) Explain the phenomenon of refraction through a thick lens and explain the formula for it. (8M)

OR

A) Describe Newton's rings experiment to find the expression for the radius of the n^{th} ring (for both dark and bright). (8M)

B) With the help of a neat ray diagram, explain the spherical aberration of lens. Explain any two way to reduce spherical aberration. (7M)

OR

B) Explain the construction of spectrometer with the help of neat diagram. (7M)

C) Describe Schuster's method. (5M)

OR

C) Two thin lens of focal lengths 15cm and 20cm are placed coaxially parallel to each other at a distance 5 cm apart. Find the equivalent length and plot the cardinal points and planes. (5M)

Q2) Answer the following.

(20M)

A) Describe the construction and working of He-Ne laser with the help of energy level diagram (8M)

OR

A) What is numerical aperture (NA) of an optical fibre? Derive necessary expression for it. (8M)

B) Explain the following properties of laser

i. Monochromaticity

ii. Coherence

iii. Intensity and power

iv. Directionality

(7M)

OR

B) Describe structure of a step-index optical fibre. Explain the propagation of light through it. (7M)

C) Explain reconstruction of image in holography with neat and labelled diagram. (5M)

OR

C) Determine:

i. The critical angle of reflection for core-cladding boundary and

ii. The acceptance angle of the fibre

Given: R.I. of core = $n_1 = 1.4$

R.I. of cladding = $n_2 = 1.3$

(5M)

(20M)

Q3) Answer the following.

A) What are the limitations of Vander waals equation. Find the equation of the curve passing through maxima and minima of vander waals isothermals. (8M)

OR

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A) Define molar specific heats of a gas and show that for a perfect gas, $C_p - C_v = R$ (8M)

B) Derive the relations between Vander waals constants and critical constants. (7M)

OR

B) Derive an expression for the work done by a perfect gas in an adiabatic change. (7M)

C) Explain Zeroth law of thermodynamics. (8M)

OR

C) Define critical coefficient. Show that its theoretical value is 2.667 (8M)

Q4) Answer the following.

(15M)

A) Write a note on graded index fibre with neat labelled diagram.

B) Explain the term 'deviation' in case of lens. Hence prove that the deviation does not depend on the position of an object.

C) The core and cladding of an optical fibre has refractive indices 1.5 and 1.47 respectively. Find the acceptance angle in air and the critical angle for core-cladding interface.

D) Calculate the wavelength of light that incident 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.

E) The critical temperature and the critical pressure of a gas are 155°C and 77 atm respectively. Find the critical volume. Also calculate Vander waals constants, $R = 8.2 \text{ JK}^{-1} \text{ mol}^{-1}$, $1 \text{ atm} = 1.013 \times 10^5 \text{ Nm}^{-2}$.

F) State the concept of heat and define thermal interaction.