S.Y.B.SC. SEM – III (CBCS - 2016 COURSE) : SUMMER - 2018

SUBJECT: PHYSICS: OPTICS

Day : **Tuesday**
Date : **24/04/2018**

S-2018-0653

Time: **03.00 PM TO 06.00 PM**
Max. Marks: 60

N. B.:

1) All questions are **COMPULSORY**.
2) Figures to the right indicate **FULL** marks.
3) Draw diagrams **WHEREVER** necessary.
4) Use of calculator and log table is allowed.

Q.1 Answer any **TWO** of the following: **(12)**

a) Prove that for a combination of two thin lenses of focal lengths f_1 and f_2 separated by distance x, the focal length of the combination is given by

$$\frac{1}{f} = \frac{1}{f_1} + \frac{1}{f_2} - \frac{x}{f_1 f_2}$$

b) Explain the principle of laser and state any two applications of it.

c) The lenses in Huygen's eye-piece have focal lengths of 2cm and 6cm. Find the distance between them and sketch the cardinal points.

Q.2 Answer any **TWO** of the following: **(12)**

a) Obtain the condition $2\mu d\cos\beta = n\lambda$ for destructive interference in the reflected system of rays from a thin film.

b) Give theory of plane transmission grating and derive the intensity equation

$$I = I_o\left(\frac{\sin\alpha}{\alpha}\right)^2 \frac{\sin^2(N\beta)}{\sin^2\beta}$$

c) i) Explain production of plane polarized light by reflection.

ii) The polarizing angle for air and transparent material is 60^0. Calculate refractive index of material. What is the angle of refraction in the medium?

Q.3 Answer any **TWO** of the following: **(12)**

a) Give the theory of plane transmission grating. Explain the conditions under which principal maxima will occur.

b) Draw ray diagram of Ramsden's eyepiece. Explain its working and show principal points and focal points.

c) Explain refraction at a single curved surface and derive the relation :

$\left(\frac{\mu_2}{v} - \frac{\mu_1}{u}\right) = \left(\frac{\mu_2 - \mu_1}{R}\right)$ where notations have usual meanings.

P.T.O.

Q.4 Answer any **THREE** of the following: **(12)**

a) i) Calculate the focal length of a double convex lens for which the radius of curvature of each surface is 25 cm and refractive index of the material of the lens is 1.5.

ii) A converging lens of focal length 6.25 cm is used as a magnifying glass. If the near point of the observer is 25 cm from the eye and the lens is held close to the eye calculate:

a) the distance of the object from the lens

b) the angular magnification

b) Prove the relation, $\lambda = \frac{D_m^2 - D_n^2}{4(m-n)R}$ for Newton's rings.

c) Explain positive and negative crystals with two examples each.

d) i) Draw ray diagram for compound microscope.

ii) Define magnifying power of a compound microscope.

Q.5 Answer any **FOUR** of the following: **(12)**

a) State three points of difference between Fresnel's diffraction and Fraunhoffer's diffraction.

b) i) Define grating element.

ii) A parallel beam of light of wavelength 6000 A° is used for obtaining Newton's rings in the reflected light. Determine the radius of 4^{th} dark ring if the radius of curvature of the plano-convex lens is 80 cm.

c) Explain Brewster's law and describe how it can be used to produce the plane polarized light.

d) Explain the theory of quarter wave plate.

e) Define the following terms for laser:

i) optical pumping ii) population inversion

f) State three points of difference between interference and diffraction.

* * * * *