05/05/2015 [Additional Exam]

VCD S.Y.B.SC IV SEMESTER 2014-15 PHYSICS I 75 MARKS TIME:2:30HRS

Note: - i) All the questions are compulsory.

ii) Figure to the right indicates full marks.

iii) Use of non-programmable calculator is allowed.

Q1- Attempt the following: [20]

A) Explain Fresnel's treatment of the wave-front and his assumption to justify the phenomena of diffraction. [8]

OR

A) Give a brief account of Fresnel's diffraction of a cylindrical wavefront at a straight edge. Obtain an expression for the position of maximum and minimum intensity. [8]

B) In case of Fresnel's diffraction at a straight edge show that the diffraction bands produced are not equally spaced. [7]

OR

B) Explain the Fraunhoffer diffraction at a single slit. Derive an expression for the width of central maxima. [7]

C) Distinguish between Interference and diffraction. [5]

OR

C) A fabric with 600 threads/cm is illuminated by a light of wavelength 6000Å.Find the angle between the central image of a light and its first order diffracted image. [5]

Q2) Attempt the following: [20]

A) What do you understand by double refraction? Explain production of linearly polarized light through Nicol prism. [8]

OR

A) Give the mathematical analysis of the superposition of two linearly polarized light waves at right angles to each- other. [8]

B) Explain the formation of linearly polarized light through pile of plates. [7]

OR

B) Explain the phenomenon of polarization by reflection. [7]

C) State and explain the low of malus. [5]

OR

C) Determine the least thickness of a quarter-wave plate if a light of wavelength 5893 Å passes through it; the refractive indices of ordinary is 1.54 and that extraordinary ray is 1.55 respectively. [5]

Q 3) Attempt the following: [20]

A) Derive an expression for the resolving power of a telescope. [8]

OR

A) Describe the principle, construction and working of Michelson Interferometer. [7]

B) Describe Michelson-Interferometer. How will you use it to calibrate a meter in terms of a standard wavelength? [7]

OR

B) Show that for a plane transmission grating R.P = nN. [7]

C) What is the diameter of the objective of a telescope which is used to resolve the two distant point objects by 6.1×10^{-6} radians for light of wavelength 5890Å. [5]

OR

C) In Michelson Interferometer, the mirror m_1 is moved through a distance of 0.4220mm.Determine the number of fringes that passes that passes the cross-wire for a light of wavelength 5627Å. [5]

Q4. Attempt any three of the following: [15]

A) Determine the R.P of a telescope which has an objective lens of 300 inches diameter, for a light of wavelength 6000Å.

B) A half-inch plane transmission grating is capable of resolving the sodium lines D1 & D2.calculate the minimum number of lines /cm.

C) In a Fabry-Perot interferometer, if the length of etalon is 1.2 cm. Find the free spectral range in the wavelength in the wavelength region 5000Å.

D) Calculate the minimum plate separation in a FPI to obtain a free spectral range of 0.05Å in the wavelength region 6000Å.

E) A light of wavelength 5890Å passes through 1.47×10^{-2} mm thick double any three any three refracting plate. The plate produces a path difference of $\lambda/4$ between the ordinary and extraordinary ray. Calculate the different in their refractive indices.

F) A grating has 3000 lines/cm. How many orders will be visible if a light of 5000Å is incident normally on it?