7/10/2017

VCD S.Y. B.Sc.ATKT PHYSICS-I IV- SEM 2017-18 75 MARKS 2 1/2HRS.

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 A) Attempt any one. [8 M]

a) Give a brief account of fresnel's diffraction of a cylindrical wavefront of a straight edge. Obtain an expression for the position of maximum and minimum intensity .Comment on the result.

b) Discuss the Fraunhofer double slit diffraction phenomenon .Explain the formation of interference bands. Hence show that the angular separation between any two successive maxima or minima is inversly propotional to (a+b).

Q.1 B) Attempt any one. [7 M]

a) Discuss the phenomenon of diffraction at right edge.Explain the intensity distribution at a point 1) Inside a geometrical shadow 2) Outside a geometrical shadow

b) Explain the vector polygon method to show that the resultant intensity at any point on the screen is given by $I=I_0(\frac{\sin\alpha}{\alpha})^2$

Q.1 C) Attempt any one. [5 M]

a) A light of wavelength 6000 Å illuminates a narrow ractangular slit places at a distance of 0.2 m from a straight edge. Find the separation between the first and second bright band when observed on a screen at a distance of 0.5 m from the edge.

b) Explain the concept of plane diffraction grating.

Q.2 A) Attempt any one. [8 M]

a) Describe the principle ,construction and working of Michelson Interferometer.

b) Explain the principle of Febry-Perot interferometer .Describe the formation of circular fringes.

Q.2 B) Attempt any one. [7 M]

a) Describe an expression for the resolving power of telescope.Comment on the result.

b) Show that for a plane transmission grating R.P.= nN.

(P.T.O.)

Q.2 C) Attempt any one.

a) On a plane grating a light wavelenght 5000 Å falls normally.It produces two successive maxima at $\sin\theta = 0.3$ respectively. If the grating is 2.5 cm wide. Calculate the grating element of the resolving power in the second order. [5 M]

a) b)In Febry-Perot interferometer, if the lenght of etalon is 1.2cm .Find the free spectral range in the wavelenght region 5000 Å.

Q.3 A) Attempt any one.

a) Give the mathematical anylysis of the superposition of the two lineraly polarized waves right angle to each other. [8 M]

b) Explain the construction and working of a i) quarter wave plate ii) half wave plate , Determine their thickness what will happen if they are placed in the path of a plane polarized beam.

Q.3 B) Attempt any one.

a) Explain the phenomena of double refraction on the basis of Huygen's principle. [7 M]

b) Explain the concept of polarization of light. A quartz crystal has refractive indices 1.55085 and 1.54181.Determine the thickness of a half wave plate for Fraunhaffer (line) of wavelength 6563Å.

Q.3 C) Attempt any one.

a) Determine the least thickness of quarter-wave plate if a light of wavelength 5893 Å passes through it. the refractive indices of ordinary ray is 1.54 and extraordinary ray is 1.055 respectively. [5 M]

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

Q.4 Attempt any three.

a) Quartz crystal has refractive index 1.553 and 1.544 for extraordinary and ordinary ray respectively . Find the thickness of the quarter wave plate for the Sodium light of wavelenght 5890Å. [15 M]

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

c) A narrow slit is illuminated by a light of wavelength λ placed of 0.1 m from a straight edge .If the distance between the first and second dark band is 0.7786×10^{-3} m determine the wavelenght of the source if the screen is at a 0.5m away from the edge.

d) Explain how to obtain the localised fringes in Michelson-Interferometer.

(P.T.O.)

e) Calulate the minimum plate separation in a FPI to obtain a free spectral range of 0.05 Å in awavelenght region 6000 Å

f) What is the diameter of the objective of a telescope,which is used to resolve the two distant objects by 6.1×10^{-6} radians for thelight of wavelenght 5890 Å.

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