SY.BSC SEM IV (Phy) - 1

02/03/15

2/3/15

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 the Fraunhoffer diffraction at a single slit show that: secondary maxima occurs at $\pm 3\pi/2, \pm 5\pi/2, \ldots\ldots$etc. [8]

OR

A) Give an account of Fresnel's theory of diffraction at a straight edge. Explain the diffraction pattern on the basis of Fresnel's half period strips. [8]

B) Discuss the Fraunhoffer double slit diffraction phenomenon .Show that the angular separation between any two consecutive minima or maxima is equal to $\lambda/(a+b)$. [7]

OR

B) Explain Huygen-Fresnel's theory of diffraction. [7]

C) Distinguish between prism spectrum and grating spectra . [5]

OR

C) Determine the number of lines in 1cm of the grating surface when a plane transmission grating diffracts second order through 30^0 for incident light of wavelength 5000Å. [5]

Q2) Attempt the following: [20]

A) Discuss theoretically the superposition of two linearly polarized light waves propagating in the same direction having same frequency when the optical vectors are parallel to each other. [8]

OR

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

B) Explain the phenomena of double refraction on the basis of Huygen's theory. [7]

OR

B) Give necessary mathematical treatment to show that elliptically and circularly polarized light are the special cases of the linearly polarized light. [7]

C) A quartz crystal has refractive indices 1.55085 and 1.54181. Determine the thickness of half wave plate for the Fraunhoffer line of wavelength 6563Å. [5]

OR

C) State and explain the law of Malus. [5]

Q3) Attempt the following: [20]

A) Using a Michelson -Interferometer explain how you will determine the thickness of a thin transparent plate of refractive index (μ). [8]

OR

A) Show that for a plane transmission grating R.P= nN. [8]

B) Explain the Formation of circular & straight fringes in Michelson- Interferometer. [7]

OR

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

C) A telescope of 20cm objective is focused towards the moon at a distance 4×10^5 km. Determine the distance between the two objects on the moon, if they are just resolved by a telescope. Wavelength (λ) = 5800Å. [5]

OR

C) Determine the resolving power of telescope which has an objective lens of 300 inches diameter, for a light of wavelength 6000Å. [5]

Q4) Attempt the following: (any three) [15]

A) What is mean by Polarization of light? Explain.

B) A grating fully resolves the two lines whose wavelengths are 5890Å & 5896Å in the second order. Find the minimum number of lines in a grating.

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

D) A grating has 5000 line/cm & they are ruled over a width of 10cm. What is the smallest wavelength difference that could be resolved in the region of light 5×10^{-5} cm in the first order?

E) A grating has 2500 lines/cm. How many orders will be visible if a light of wavelength 5000Å is incident normally on it?

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