June - July 2007

Bachelor of Computer Application (BCA) Examination

II Semester

Physics - II

Time : 3 Hours] [Max. Marks : 40

Note : *Attempt all five questions. Each question carries equal marks and has internal choice.*

1. (a) Write down Maxwell's Equations in vector form and explain various physical quantities used therein.

(b) For a linear, isotropic and homogeneous medium write down all the constitutive relations.

OR

(a) Explain briefly the following :
(i) Skip Distance (ii) Poynting Vector (iii) Critical Frequency.

(b) Show that when an electromagnetic wave travels through a dielectric, the wave speed is less than the speed of light in vacuum C.

2. (a) How interference takes place by :
(i) division of amplitude.
(ii) division of wave front.
Explain with suitable example for each case.

(b) Obtain expressions for the constructive and destructive interference when light of wavelength λ is incident on a thin film of thickness t.

OR

(a) Explain with suitable diagram, the formation of Newton's rings. Write whether these rings are of equal inclination or equal thickness.

(b) In a Newton's rings setup, the radius of curvature of the lens is 50 cm. Radii of 9th and 16th dark rings are 0.18 cm. and 0.2235 cm. respectively. Calculate the wavelength of light used.

3. (a) Show that the intensity distribution in the diffraction pattern due to a narrow slit is given by :

$$I = I_0 \frac{\sin^2 \beta}{\beta^2}$$

where I_0 is the intensity at Central Maxima and $\beta = \frac{\pi b \sin \theta}{\lambda}$, b is the width of the slit and θ is the angle between diffracted ray and normal to the slit.

(b) Write down the main differences between Fresnel's and Fraunhofer types of diffraction.

OR

(a) Explain the term 'limit of resolution'. What is Reyleigh Criterion for the limit of resolution.

(b) For a diffraction grating of width 5 cm. with slits of width 0.0001 cm. separated by a distance of 0.0002 cm.
(i) What is the value of grating element ?
(ii) How many orders would be observed for $\lambda = 5.5 \times 10^{-5}$ cm.

4. (a) Explain with suitable diagram, the phenomenon of double refraction.

(b) What are Uniaxial Crystals ? Discuss Huygen's theory of double refraction for uniaxial crystals.

OR

(a) Explain the construction and working of a Nicol Prism.

(b) How does it work as a polariser and analyser ?

5. (a) Explain with the help of suitable diagram the :
(i) Spontaneous emission
(ii) Stimulated emission
(iii) Stimulated absorption.

(b) Discuss the working of a Rubi Laser with the help of energy level diagram.

OR

(a) Discuss the meaning of spatial and temporal coherence in context with a laser beam.

(b) Calculate the coherence length of a CO_2 laser whose line width is 1×10^{-5} nm at IR emission wavelength of 10.6 μm.

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