Uni. Roll NO.:- .....

SET-B

GLA University, Mathura
Course:- B.Tech. I-Year, II-Mid Term (Odd Sem.) Examination, 2012-13
Subject:- Physics-I (AHP-101)

Time:- 90 Minutes M.M.:- 20

Notes:-

1. Answer all questions from Group A (which is) **compulsory, Any Two** from Group B and **Any Two** from Group C.
2. All questions of the particular group should be answered collectively at one place.
3. Answer should be brief and to-the-point and be supplemented with neat sketches.
4. Any missing or wrong data may be assumed suitably giving proper justification.
5. Figures on the right-hand side margin indicate full marks.

Group –A (All Questions are compulsory) 08x0.5=04

Q1. **(i) Polarisation of light proves the**

- transverse wave nature of light
- longitudinal wave nature of light
- quantum nature of light
- corpuscular nature of light

(ii) Plane polarized light is passed through an analyser. If the analyser is rotated through 60^0 about the direction of incident light, the intensity of light is

- no change in intensity
- zero
- ½ intensity of the incident light
- ¼ intensity of the incident light

(iii) A polarized beam is one in which

- magnetic vector vibrates in all possible directions.
- electric vector vibrates in all possible directions.
- electric vector vibrates in a direction perpendicular to the direction of the propagation of the wave.
- none of the above.

(iv) In a calcite uniaxial negative crystal the relation between the velocities (v_e & v_0) of E and O-rays is

- $v_e > v_0$
- $v_0 > v_e$
- $v_e = v_0$
- $v_0 = ½\ v_e$

(v) Nicol prism is based on the phenomenon of

- reflection
- refraction
- double refraction
- scattering

(vi) Circularly polarized light is produced if the amplitudes of the ordinary and extra ordinary rays are equal and there is a phase difference of

- $\pi/2$
- π
- $\pi/4$
- zero

P.T.O.

(vii) The substances that show the phenomenon of optical rotation are said to be

- optically active
- optically inactive
- isotropic alkaline crystals
- anisotropic oxide crystals

(viii) In an optical fibre, the relation between acceptance angle (α) and Numerical aperture (NA) is

- $\alpha = Sin^{-1}(NA)$
- $NA = Sin^{-1}(\alpha)$
- $NA = Sin^{2}(\alpha)$
- $\sin\alpha \times NA = 1$

Group – B
(Attempt any two questions) 3x2=6

Q1. Obtain an expression for the minimum thickness of a quarter wave plate. Find the thickness of a quarter wave plate when the wavelength of the light is equal to 5890 Å and $\mu_0 = 1.55$ and $\mu_e = 1.54$.

Q2. What is meant by specific rotation. The plane of polarisation of the plane polarized light is rotated through 6.5^0 in passing through a length of 20 cm of sugar solution of 5% concentration. Calculate the specific rotation of the sugar solution.

Q3. Define the acceptance angle and numerical aperture of the optical fibre. An optical fibre has a core refractive index of 1.360 and cladding refractive index of 1.335. Calculate the value of the numerical aperture and the acceptance angle.

Group – C
(Attempt any two questions) 5x2=10

Q1. Discuss theoretically the superposition of two linearly polarized light waves having perpendicular vibrations and pass through the calcite crystal. Obtain the expressions for the resultant linearly and circularly polarized light using the different conditions of phase difference between E and O – waves.

Q2. Explain the phenomenon of optical rotation. Show that the angle of rotation $(\theta) = \pi d/\lambda\ (\mu_L - \mu_R)$, where symbols have there usual meaning.

Q3. Classify the optical fibres dependent on materials and number of modes. Also establish the relation between acceptance angle and numerical aperture for optical fibre.