

**3 SEM TDC PHY M 1**

**2016**

( November )

**PHYSICS**

( Major )

Course : 301

( Optics )

Full Marks : 60

Pass Marks : 24 (Backlog)/18 (2014 onwards)

Time : 3 hours

The figures in the margin indicate full marks for the questions

Choose the correct answer from the following :

1×6=6

(a) In Ramsden's eyepiece

(i) there is no cross wire

(ii) the cross wire lies outside but in front of the field lens

(iii) the cross wire lies between the field lens and the eye lens

(iv) None of the above

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Phy = 201, 202, (301)<sup>6</sup>

Geo = 303

Stat = 201, 202,

Prob = 203, (301)<sup>6</sup>

Mod4 = 201, 202 (201)<sup>6</sup>

5 Copy (M)

3 4 (6)

(b) The path difference between two rays meeting at a point from two coherent sources is odd multiple of  $\frac{\lambda}{2}$ . The intensity at the point will be

(i) maximum

(ii) proportional to  $\frac{\lambda}{2}$

(iii) proportional to  $\lambda$

(iv) minimum

(c) The contrast of fringes in an interference pattern depends on

(i) fringe width

(ii) wavelength

(iii) intensity ratio of sources

(iv) distance between the slits

(d) A diffraction pattern is obtained using a beam of red light. What happens if red light is replaced by blue light?

(i) Diffraction bands become narrower and crowded together

(ii) Bands become broader and farther apart

(iii) Bands disappear

(iv) No change

- (e) From Brewster's law for polarization, it follows that the angle of polarization depends upon the
- (i) plane of vibrations and orientations
  - (ii) plane of polarization orientations
  - (iii) velocity of light
  - (iv) wavelength of light
- (f) The telescope which has a large spherical mirror with an aperture at the centre is known as
- (i) Galilean telescope
  - (ii) Cassegrainian telescope
  - (iii) Newtonian telescope
  - (iv) None of the above

2. (a) Explain the defects coma and astigmatism. 2
- (b) In what respect do Lloyd's mirror fringes differ from those of biprism fringes? 2
- (c) Describe the formation of interference fringes in case of Fresnel's biprism experiment. 2
- (d) Calculate the fringe width of interference pattern produced in double-slit experiment with two slits  $10^{-3}$  m apart on a screen 1 m away. (Given,  $\lambda = 5893 \text{ \AA}$ ) 2

- (e) What are Fresnel's half-period zones? Why is it so called? 2
- (f) What are normal dispersion and anomalous dispersion? 2
3. (a) Give the construction and working principle of a Ramsden's eyepiece. Why is it called a positive eyepiece? 4+1=5
- (b) Find the condition of achromatism of two lenses in contact with each other. 3
- (c) Describe the working of a Michelson's interferometer. 4
- (d) What do you mean by positive and negative crystals? Give an example of each. 2+1=3
4. (a) What are different types of defects in an uncorrected lens? 3
- (b) A biprism of obtuse angle  $176^\circ$  is made of glass of refractive index 1.5. A slit illuminated by monochromatic light is placed 10 cm behind the biprism and the width of the interference fringes found on a screen 90 cm in front of the biprism is  $10 \times 10^{-3}$  cm. Find the wavelength of light. 3

- (c) Discuss Fraunhofer diffraction pattern due to a single slit giving analytically the distribution in intensity in the pattern. Find expression for width of central maxima. 5
- (d) Describe a Nicol's prism showing clearly how it is used as a polarizer and analyzer. 5
- (e) Explain how interference fringes are formed by a thin wedge-shaped film, when examined by normally reflected light. 4
5. (a) Find an expression for the fringe width in case of Young's double-slit experiment. 5
- (b) Prove that the area of half-period zone on a plane wavefront is essentially independent of the order of the zone. 2

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