

Assignment
PHYSICS (Major)

Paper: 402

Full Marks : 50

Time : 3 hours

Submission date: 10/08/2020

GROUP – A

(Wave Optics)

(Marks : 35)

1. Answer the following questions: 1×4=4
- (a) What do you understand by the term zone plate?
 - (b) In Young's double-slit experiment, if one of the slits is closed, what happened to the interference pattern?
 - (c) What do you mean by grating element?
 - (d) Define specific rotation for an optically active solution?
2. Answer the following questions: 2×2=4
- (a) What is a quarter wave plate? Give the use of a quarter wave plate?
 - (b) Why do we see colours when white light falls on a thin film of transparent medium?
3. Answer any *two* questions of the following: 5×2=10
- (a) Derive the mathematical expression of resultant intensity of the beam suffering Fraunhofer diffraction in single slit. 5
 - (b) What are plane of polarization and plane of vibration? How can circularly and elliptically polarized light be produced with the help of retarding plate? 1+1+3=5
 - (c) Describe the method to determine the wavelength of light with the help of Fresnel's biprism interference phenomenon. Draw the proper schematic diagram. 5
4. Explain how the wavelength of light can be determined with a plane transmission grating? What are the merits of a concave grating over a transmission grating? 5+2=7

5. Deduce the relation $\frac{1}{u} + \frac{1}{v} = \frac{m\lambda}{r_m}$ for a zone plate. Give two dissimilarities of a zone plate and convex lens. Explain the construction and working of Laurent half-shade polarimeter. 3+2+5=10

GROUP – B

(Special Theory of Relativity)

(Marks : 15)

6. Answer the following questions: 1×2=2
- (a) Find the moving mass of an electron in terms of rest mass m_0 , if $v = 0.8 c$.
 - (b) Can it be justified that a body can never attain or exceed the speed of light? Justify your answer.
7. Answer the following questions: 2×2=4
- (a) Show that the particle of zero rest mass must travel at the speed of light in vacuum.
 - (b) What was the main objective of the Michelson-Morley experiment? Write the conclusions.
8. Derive the relativistic formula for composition of velocities. 4
9. Answer any *one* question of the following: 1×5=5
- (a) Establish the relation $E^2 - p^2c^2 = m_0^2c^4$ where p is the linear momentum, m_0 is the rest mass and E is the total energy of the particle. 5
 - (b) Establish length contraction as a consequence of Lorentz transformations. 5

N.B. – Mention your class roll no. and GU roll no. at the answer script properly. Upload the pdf version of answer script at the web portal adjacent to the view bottom of respective paper.