Q.P. Code No. 41421

Fourth Semester B.Sc., Degree Examinations

May / June 2026

(CBCS - SEP Scheme)

PHYSICS

SSD0210 : Paper IV : Electrodynamics and Optics

Time: 3 hrs.] *[Max.Marks: 80*

Instruction to the Candidates :

1. *The student should legibly write Section number along with question numbers within the margin only.*
2. *The answers without Section number and question numbers will not be valued.*
3. *Do not write anything (except register number) on the question paper.*
4. *The question paper consists of Three sections A, B & C. All sections are compulsory.*
5. *Answer ALL the questions in Section - A, any SIX questions in Section-B, any THREE questions in Section-C.*
6. *Draw neat and labeled diagrams wherever necessary.*
7. *Take necessary data from tables.*
8. *Symbols used have their usual meaning.*
9. *Use of Scientific Calculator is allowed.*

SECTION – A

I. Answer ALL the following questions. **(10X2=20)**

1.

a) State and explain Biot-Savart's law.

b) Current loop behaves as a magnetic dipole. Explain.

c) State Poynting's theorem and mention its significance.

d) What is meant by Achromatization? What are different types of aberration ?

e) What is wave front? Mention different types of wave front.

f) What are the necessary conditions for interference?

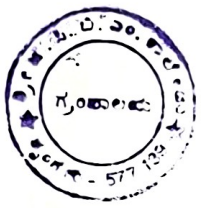
g) Distinguish between Fresnel's and Fraunhoffer diffraction.

h) Define dispersive power of grating and write the expression for it.

Contd...2

i) Write the expression for Lorentz force on a charged particle and explain the terms in it.

j) What is Kerr Effect? Explain.



SECTION – B

II. Answer any SIX of the following questions. (6X5=30)

2. State and explain Ampere's circuital law. and hence obtain an expression for the magnetic field at point due to a straight current carrying conductor.

3. A parallel plate capacitor with circular plates of radius 12cm is being charged. The electric field E between the plates is changing at a rate of $2x10^{12}$ v/m.s Calculate displacement current density.

4. Set up differential equations for the electromagnetic waves and obtain an expression for velocity of these waves, in a free space.

5. Explain the construction and working of Ramsden's eyepiece. How Chromatic and spherical aberration minimized in the eyepiece?

6. Using Fermat's principle derive the law of refraction of light.

7. Describe the construction and working of Michelson interferometer.

8. Describe the construction and working of zone plates. Compare zone plate and convex lens.

9. Write a note on specific rotation and double refraction,

SECTION – C

III. Answer any THREE of the following questions. (3X10=30)

10. a) Show that i) electromagnetic waves are transverse in nature, and ii) $\vec{E}$ and $\vec{B}$ are perpendicular to each other.

b) Estimate the value of permittivity of free space assuming the value of velocity of e.m.waves in free space. Take $\mu_0 = 4\pi \times 10^{-7}\ HM^{-1}$ (7+3)

Contd...2

11. a) Derive lens makers formula using wave theory.

    b) Mention Cardinal points and define any one of them. **(8+2)**

12. a) What are Newton's rings? Give the theory of Newton's rings.

    b) A biprism is placed 0.05m from a slit illuminated by sodium light (λ =589nm). The width of the fringes obtained on a screen placed 0.75m from the biprism is 9.424×10^{-2} cm. What is the distance between the two coherent sources? **(7+3)**

13. a) Explain the method of Production and analysis of plane, elliptical and circularly polarized light.

    b) A half wave plate is constructed for a wavelength of 6000Å. For what wavelength does it work as a quarter wave plate. **(8+2)**

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