27321(New)

B.Sc. III Semester Degree Examination, March/April - 2021

PHYSICS

Optical Instruments, Laser And Electrodynamics

Paper - 3.1

(New)

Time : 3 Hours **Maximum Marks : 60**

Instructions to Candidates:

1. Part - A: **All** are Compulsory.
2. Part - B: Solve any **Five** questions.

PART - A

Answer the following questions. **(10×1=10)**

1. a) What is meant by Chromatic aberration?

b) What are focal points?

c) What is meant by metastable state?

d) Define scalar product.

e) State Gauss divergence theorem.

f) State Columb's law in electrostatics.

g) Define electric potential at a point.

h) Define electric dipole.

i) What is solenoid.

j) Write the equation of velocity of light in a medium.

PART - B

2. a) What is meant by achromatic aberration? Derive the condition for achromatism of two thin lenses separated by a finite distance.

b) Two convex lenses of focal length 0.1m and 0.2m are placed 0.08m apart. Calculate the equivalent focal length. **(7+3=10)**

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3. a) Derive an expression for the equivalent focal length of two thin converging lenses separated by a distance in a Co-axial system.

   b) Two converging lenses of Powers 5 diopters and 4 diopters are placed Coaxially 12cm apart. Find the focal length of combination. **(7+3=10)**

4. a) Describe the construction and working of semiconductor laser.

   b) Mention the application of laser. **(6+4=10)**

5. a) State and prove Stokes theorem.

   b) Show that $\nabla.(\nabla\phi) = \nabla^2\phi$. **(6+4=10)**

6. a) Obtain the expression for the magnetic field at a point due to a straight conductor of finite length.

   b) State and explain Biot - Savart's Law. **(6+4=10)**

7. a) Obtain the expression for the torque on a dipole in a magnetic field.

   b) A coil produces a self induced voltage of 60mV when the current in the coil varies at the rate of 30mA per milli second. What is the self inductance? **(6+4=10)**

8. a) Derive the electromagnetic wave equation in a free space.

   b) Mention the characteristics of electromagnetic waves. **(7+3=10)**