

ST. JOSEPH'S COLLEGE (AUTONOMOUS), BANGALORE-27
B.Sc. PHYSICS - III SEMESTER
SEMESTER EXAMINATION: OCTOBER 2019
PH 318 –ELECTROMAGNETISM, SOUND AND PHYSICAL OPTICS

Time- 2 1/2 hrs

Max Marks-70

This question paper contains 2 printed pages and 3 parts

PART-A

Answer any **FOUR** of the following.

[4x10=40]

1. State and explain Ampere's circuital law. Obtain an expression for the magnetic field at a point on the axis of the solenoid. [5+5]
2. a) State and prove the integral form of Gauss law in electrostatics.
b) Obtain an expression for electric intensity due to a dipole. [5+5]
3. With relevant theory explain the formation of colours by a thin film in reflected light and obtain the path difference between the reflected rays. [10]
4. Explain the theory of diffraction due to a straight edge. [10]
5. (a) State and explain Brewster's law. .
(b) Give the theory of retarding plates and obtain general expression for elliptically polarized light. [3+7]
6. Derive an expression for the electromagnetic wave propagation through an isotropic dielectric medium. Deduce an expression for the velocity of the wave [10]

PART-B

Answer any **FOUR** of the following.

[4x5=20]

7. Monochromatic light emitted by a broad source of wavelength 6000\AA falls normally on two plates of glass which encloses a wedge shaped film. The plates touch at one end and are separated at a point 15cm from that end by a wire of 0.05mm diameter. Find the distance between the two fringes.
8. A diffraction grating consists of 5×10^5 lines/m is used at normal incidence. Calculate the dispersive power of the grating in the first order spectrum for the wavelength 5461\AA

9. Calculate the velocity of sound waves in sulphur dioxide at NTP. Density of sulphur dioxide at NTP is 2.63kg/m^3 and the adiabatic ratio of the gas is 1.29. Calculate its velocity at 310K.
10. Calculate the mutual inductance between two coils when a current of 4A changing to 8A in 0.5 s in one coil induces an emf of 50 mV in the other coil.
11. If $\mathbf{F} = \nabla(xy^3z^2)$ find $\text{div. } \mathbf{F}$ and $\text{Curl } \mathbf{F}$ at the point (1,-1,1).
12. A condenser with two horizontal metal plates separated by a distance of 4mm is given potential of 9.8V. A particle of mass 0.01g and charge (-q) is at rest at a point between the plates. Find the value of charge q.

PART-C

Answer and **FIVE** of the following questions.

[5x2=10]

13. a) Give the importance of Poisson's and Laplace's equation.
b) Why are Newton's rings circular?
c) A telescope of aperture 0.05m views a wire gauze from a distance of 1m by using illuminating light of wavelength 500nm. What is the smallest structure of the gauze which can be clearly seen?
d) A calcite plate behaves as a half wave plate for a particular wavelength λ . What is the variation μ with respect to λ ?
e) Why speed of sound is more in hydrogen than in oxygen?
f) Eddy current is often a disadvantage but sometimes advantageous. Explain.