

HARINGHATA MAHAVIDYALAYA

Sem. II 2nd Internal Assessment Examination - 2019

B.Sc. (Physics Hons.)

Sub: - PHY-H-T-CC-03,

Subject Title – Electricity & Magnetism.

Coverage: - Dielectric properties of matter, Electrical circuits, Electromagnetic induction, Ballistic Galvanometer.

Submission from 22.05.2019 to 31.05.2019

Answer any two questions.

Maximum Marks. 2×5=10

1. Consider the parallel plate capacitor with a dielectric slab of dielectric constant K filling the entire space between the plate. It is given a charge Q and it is kept isolated. Show that the work done against the electric forces to remove the slab is $\frac{Q^2(K-1)}{2CK}$, where C is the capacitance in the absence of the slab. (5)
2. Calculate the mutual inductance of two similar co-axial coils. (5)
3. Work out the theory of working of a suspended coil type Ballistic Galvanometer. Explain the meaning of log decrement. (3+2)
4. How can Sharpness of Resonance be achieved in a series LCR circuit? Explain with the help of rotating vectors and j -operator. (5)
5. Establish Clausius-Mossotti relation for a non-polar dielectric? What is the importance of this equation? (4+1)

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SEM-II 2nd Internal Assessment Examination-2019

B.Sc.(Hons)

Sub: PHY-H-CC-T-04 (WAVE AND OPTICS)

Coverage: Superposition of waves & Interference, Interferometer

Submission from 22.05.2019 to 31.05.2019

Answer any two (2) questions:

F.M.2x5=10

1. a) Show that in case of superposition of waves from two incoherent sources the resultant intensity is the sum of individual intensities. Write the conditions for observable interferences pattern.
b) Why the light from two different candles not seen to interfere? (2 + 1 + 2)
2. a) Write down the three dimensional differential wave equations. Assuming spherical symmetry solve it and obtain a spherical wave solution.
b) The Lissajous figure in the case of two tuning forks is a parabola. Prove that the frequencies are in the ratio 1: 2. What is the importance of these results? (3 + 2)
3. a) Show that in two dimensions the shape of interference fringes is hyperbolic. Why these fringes are called non-localized?
b) Newton's rings are formed in reflected light of wave length 600 nm with a combination of plane plate of glass and a Plano-convex lens of 1m radius of curvature. On introducing a liquid in between the lens and the plate it is found that the diameter of 7th dark ring decreases by 0.54mm. Find the refractive index of the liquid. (3 + 2)
4. a) Derive an expression for the intensity of the fringe system formed by the transmitted light in a Fabry-Perot interferometer. From this expression explain the term sharpness of the fringes.
b) Two mutually perpendicular oscillations are represented by

$$x(t) = a \sin \omega t \text{ and } y(t) = b \sin (2\omega t + \phi)$$

Sketch the Lissajous figure resulting from these oscillations with $\phi = -\pi$. Find the value of x for which the Lissajous figure touches the lines $y = \pm b$. (3 + 2)