3223 – C71 – IIISS – N – 14

THIRD SEMESTER B.Sc. DEGREE EXAMINATION, NOVEMBER 2014

(New Syllabus)

PHYSICS

Time : 3 Hours] [Max. Marks : 80

Answer the questions 1 *to* 4 *in the first page of the answer book.*
Calculators are allowed.

Part I (10 × 2 = 20)

Answer any **ten** *questions.*
Each question carries 2 *marks.*

1. In Huygen's eyepiece the ratio of the focal lengths of the field lens and eye lens is
   a) 1 : 2 b) 2 : 3
   c) 1 : 3 d) 3 : 1
2. Relation between dielectric constant K and susceptibility ψ_e is :
   a) $K = \frac{\psi_e}{\epsilon_o} - 1$ b) $K = 1 - \frac{\psi_e}{\epsilon_o}$
   c) $K = 1 + \frac{\psi_e}{\epsilon_o}$ d) $K = 1 + \frac{\epsilon_o}{\psi_e}$
3. Condition for resonance in LCR parallel circuit is :
   a) $R > \sqrt{\frac{L}{C}}$ b) $R < \sqrt{\frac{L}{C}}$
   c) $R = \sqrt{\frac{C}{L}}$ d) $R = \sqrt{\frac{L}{C}}$
4. The earth inductor is an instrument for measuring the :
   a) Magnetic elements. b) Strong magnetic field.
   c) Only B_H. d) B_H & B_V and dip.
5. Mention any two methods of reducing spherical aberration,
6. Write Lagrange and Helmholtz equation in case of spherical refracting surface with usual notations.
7. State Gauss Law in dielectrics.
8. Give the statement of Ampers circuited law.
9. Define *j*-operator.
10. A co-axial lens system placed in air has two lenses of focal lengths 3f and f are separated by a distance of 2f, find the equivalent focal length of the combination.
11. The lower and upper half power frequencies of resonant circuit are 2000 Hz and 2750 Hz respectively. Calculate the bandwidth.
12. The successive throws in a B.G are 10 cm and 9.8 cm on the same side. Find its logarithmic decrement. [Given log 1.0204 = 0.008770]

[P.T.O.

Part II (6 × 5 = 30)

Answer any **six** *questions.*
Each question carries 5 *marks.*

13. Show that $\frac{\text{Sini}}{\text{Sinr}} = \frac{\mu_2}{\mu_1}$ from Fermat's principle.
14. Derive the formula for the electric intensity at a point on an earth conducting plane by the method of electrical Images.
15. State and prove Ampere's Circuital Law.
16. Give the theory of decay of current through RL circuit.
17. An achromatic converging lens is formed by two lenses in contact, one having twice the dispersive power of the other. If the combination has a focal length of 0.3 m. Calculate the focal lengths of the two lenses.
18. Two similar coils of wire, having a radius of 7 cm and 50 turns have a common axis and are 18 cm apart. Find the strength of the magnetic field at a point midway between them on their common axis, when a current of 0.1 Amp. is passed through them.
19. A resistance of 8 ohms is in series with pure inductance of 0.1 H. If a potential difference of 220 volts is applied, calculate the current and voltage across the resistance, voltage across inductance and phase. (Given frequency of AC is 50 Hz.)
20. 0.2 μF capacitor is charged to 4 volts it gives a deflections of 9.6 cm and 8 cm for 1st and 11th throws when discharged through a B.G. if the time period of B.G. is 10 sec. Calculate the current sensitivity.

Part III (3 × 10 = 30)

Answer the following questions.
Each question carries 10 *marks.*

21. Mention Cardinal points of an optical system. Derive an expression for equivalent focal length of two thin lenses separated by a finite distance.

Or

What is meant by an achromatism? Derive the condition for achromatism of two thin lenses when separated by a distance.

22. State Biot-Savarts Law. Derive the expression for the magnetic field at a point due to an infinitely long straight conductor carrying current.

Or

Derive Clausis – Mossotti's equation for polarization of dielectric.

23. Derive the expressions for current, impedance and phase using j-operator in case of LCR series circuit.

Or

Describe an experiment to determine, the capacity of a capacitor using B.G. by Absolute method.