DS – 1352

III Semester B.Sc. Examination, November/December 2009
(Semester Scheme)
PHYSICS – III
Electricity, Magnetism and Radiation

Time : 3 Hours Max. Marks : 60

PART – A

Answer **any five** of the following questions. **(5×6=30)**

1. State and prove maximum power transfer theorem and show that emf of source $E = \sqrt{4R_{TH}P_{max}}$. **6**

2. With necessary theory explain the construction and working of a Ballistic Galvanometer. **6**

3. a) Explain eddy current.

   b) Obtain an expression for the magnetic energy stored in an inductor. **(2+4)**

4. Derive the Maxwell's field equations $\vec{\nabla}\cdot\vec{D}=\rho$ and $\vec{\nabla}\cdot\vec{B}=0$. **(3+3)**

5. Obtain an expression for growth and decay of charge in a C-R circuit. Define time constant of the circuit. **(4+2)**

6. Give the theory of parallel resonance circuit. Represent the variation of impedance and current with frequency. **6**

7. What is a Tait's diagram ? Explain how it can be used to determine the Peltier and Thomson co-efficient ? **(2+4)**

8. a) Define Stefan's law.

   b) Explain the energy distribution of a blackbody radiation. **(2+4)**

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PART – B

Answer **any four** of the following problems. **(5×4=20)**

9. Each of the two coils of Helmholtz galvanometer contain 50 turns of wire of mean radius 0.2 m. When a current of 0.1 A is passed through the coil, a deflection of 45° is obtained. Calculate the horizontal component of earth's field. **5**

10. A solenoid having a core of cross section 4 cm^2, half air and half iron ($\mu_r = 500$) is 22 cm long. If the number of turns on it is 1000, what will be its self inductance ? **5**

11. A coil of inductance 1.0 H and resistance 100 Ω is connected to a battery of emf 12V. Find the energy stored in the magnetic field associated with the coil at an instant 10 ms after the circuit is switched on. **5**

12. An iductance of 10 H and a resistance of 0.5 Ω are connected to a battery of emf 6.0 V. Calculate the time taken for the current to reach 6.0 A. **5**

13. A capacitor of 2 μF, an inductor of 5.0 H and a resistor of 200 Ω are connected in series to an a.c supply of 200 V and 50 Hz. Calculate the current in the circuit. **5**

14. The thermo emf in a circuit in which the cold junction is at 0°C and the hot junction at θ°C is found to be 3.5 μV at 100°C and 9.0 μV at 200°C. Assuming that thermo emf to be governed by the equation $e = a\theta + b\theta^2$. Find the constants a and b. **5**

PART – C

15. Answer **any five** of the following. **(5×2=10)**

a) Write an equation for the force acting at a point between two parallel conductors carrying current in the same direction.

b) A capacitor is connected to an a.c source. Is there a magnetic field between the plates ?

c) Why is induced emf during break of the circuit greater than that during make of the circuit ? Explain.

d) Why is shock from a.c more severe than that from d.c ?

e) When does an L-C-R circuit get critically damped ?

f) If an a.c is passed through a thermo couple instead of d.c, what will be the peltier effect ?

g) Distinguish between positive and negative Thomson effect.

h) Why is a white dress more comfortable than a darkdress in summer ?