

B.Sc. DEGREE END SEMESTER EXAMINATION MARCH 2017
SEMESTER - 2: PHYSICS (COMPLEMENTARY COURSE FOR
MATHEMATICS)

COURSE: 15U2CPPHY3: ELECTRIC AND MAGNETIC PHENOMENA,
THERMODYNAMICS AND
SPECIAL THEORY OF RELATIVITY

(Common for Regular 2016 Admission / Supplementary 2015 & 2014 Admission)

Time: Three Hours

Max. Marks: 60

PART A

Answer **all** questions. Each question carries 1 Mark

1. Distinguish between electric susceptibility and permittivity of a material?
2. What is meant by atomic polarizability?
3. What is the origin of diamagnetism?
4. What is meant by Curie point?
5. State zeroth law of thermodynamics.
6. What is an adiabatic process?
7. Write down Lorentz transformation equations.
8. Write down the equation for time dilation.

(1 x 8 = 8)

PART B

Answer **any six** questions. Each question carries 2 Marks

9. Briefly explain the field due to an electric dipole.
10. Compare ferromagnetism and ferroelectricity.
11. Explain the hysteresis of a ferromagnetic material. Give examples.
12. What is adiabatic elasticity?
13. State the 1st law of thermodynamics and give two applications.
14. Discuss the principle of heat engine and its efficiency.
15. Explain the concept of length contraction.
16. Derive the Lorentz velocity transformation equations.

(2 x 6 = 12)

PART C

Answer **any four** questions. Each question carries 5 Marks

17. Derive the relation for the torque experienced by a dipole in a uniform electric field and compare it with that of non-uniform field.
18. Derive the Gauss law in the presence of a dielectric.
19. Derive the adiabatic equations of a perfect gas.

20. A Carnot engine whose low temperature reservoir is at 7°C has an efficiency of 50%. It is

desired to increase the efficiency to 70%. By how many degrees should the temperature of high temperature reservoir be increased?

21. A stationary body explodes into two fragments each of mass 1 Kg that moves apart at the

speed of $0.6c$ relative to the original body. Find the mass of the original body.

22. Derive Einstein's mass energy relation.

(5 x 4 = 20)

PART D

Answer **any two** questions. Each question carries 10 Marks

23. a) Explain the concept of polarization and its different sources with necessary theory. Also

discuss the potential and field due to a dipole in a polarized material.

b) Explain ferroelectricity and ferroelectric domains.

24. What is magnetic hysteresis? Discuss how the hysteresis curve for a magnetic material can

be obtained experimentally.

25. Derive Maxwell's thermodynamic relations and give its applications.

26. a) Explain the Galilean transformation equations and its drawbacks.

b) Explain the postulates of special theory of relativity.

(10 x 2 = 20)
