B. Sc. DEGREE (C.B.C.S.S) EXAMINATION, APRIL, 2018
(2014 Admission Regular)
SEMESTER II - COMPLEMENTARY COURSE (PHYSICS)
PHY2EMPTSR – ELECTRIC AND MAGNETIC PHENOMENA, THERMODYNAMICS AND SPECIAL THEORY OF RELATIVITY
(For Mathematics)

Time: Three Hours   **Maximum Marks: 60**

PART A

I. Answer all questions. Each question carries 1 mark

1. What is a dielectric material?
2. Mention two applications of ferroelectric materials.
3. Distinguish between linear and nonlinear magnetic materials.
4. What are antiferromagnetic materials?
5. What is the change in internal energy of a system during a cyclic process?
6. Isothermal operations must be slow while adiabatic operations must be sudden. Explain why?
7. What are inertial frames of references?
8. What is the velocity of electron when mass becomes double the rest mass?

$$(8 \times 1 = 8)$$

PART B

II. Answer six questions. Each question carries 2 marks

9. State and explain Curie-Weiss law.
10. Compare the properties of soft iron and steel on the basis of hysteresis curve. Which one is preferred for permanent magnet? Why?
11. What is meant by a reversible process? What are the conditions required?
12. Efficiency of a heat engine is always less than 100% Why?
13. What do you mean by coefficient of performance of a refrigerator? What is the necessity of defrosting a refrigerator?
14. State and explain the principle of increase of entropy.
15. Show that adiabatics are steeper than isothermals.
16. What are the consequences of Lorentz transformation?
17. What is meant by relativity of simultaneity?
18. What are the postulates of special theory of relativity?

$$(6 \times 2 = 12)$$

PART C

III. Answer 4 questions. Each question carries 4 marks

19. The relative permittivity of Argon at 0^oC and one atmosphere is 1.000435, calculate the polarizability of the atom.
20. .A rod of a magnetic material of volume $10^{-4} m^3$ and relative permeability 1200 is placed inside a long solenoid of length 15cm. The total number of turns of solenoid is 75. A current of 0.6A is passed through solenoid. Calculate the magnetic moment developed in the rod.

21. A Carnot's engine whose source is at 127$^{\text{o}}$C take in 4200J of heat in each cycle and gives out 2520J of heat to the condenser. Find the temperature of the condenser.
22. Calculate the change in entropy when 1 kg of water at 0^{0}C is heated to 80^{0}C. Specific capacity of the water is equal to 4200 J/kg.
23. The length of a rocket is 100m on ground. While on flight its length as observed on the ground is 99 m . Calculate the speed of the rocket.
24. Calculate the energy of an electron moving at a speed of 0.99 c if its rest mass is 9x10^{31}kg.

(4 ✕ 4 = 16)

PART D

IV. Answer two questions. Each question carries 12 marks

25. Explain the different sources of polarizability in dielectrics.
26. Explain dia, para and ferromagnetism and compare the properties exhibited by materials belonging to each of these categories.
27. Discuss the conditions for a process to be adiabatic. Obtain an expression for the work done in an adiabatic process
28. Derive Lorentz transformation equations.

(2 ✕ 12 = 24)