

**B.Sc. DEGREE END SEMESTER EXAMINATION - MARCH/APRIL 2018****SEMESTER – 2: PHYSICS (COMPLEMENTARY COURSE FOR MATHEMATICS)****COURSE: 15U2CPPHY3 – ELECTRIC AND MAGNETIC PHENOMENA, THERMODYNAMICS AND  
SPECIAL THEORY OF RELATIVITY**

*(Common for Regular 2017 & Supplementary-improvement 2016/2015/2014 Admission)*

Time: Three Hours

Max. Marks: 60

**PART A** (Very short answer questions)**Answer all questions. Each question carries 1 Mark**

1. Write down the relation connecting the electric vectors electric field intensity, polarization and electric flux density.
2. Why the net magnetization of an antiferromagnetic material zero?
3. What are the basic requirements for a system to be in thermodynamic equilibrium?
4. What is Clausius statement of the second law of thermodynamics?
5. What happens to the entropy of the working substance during the Carnot cycle?
6. What is Newtonian principle of relativity?
7. Are two simultaneous events occurring at the same point simultaneous in all inertial frames? Why?
8. What do you mean by the rest mass of an object? (1 x 8 = 8)

**PART B** (Short Answer)**Answer any six questions. Each question carries 2 Marks**

9. Distinguish between non-polar and polar dielectrics.
10. Discuss the different sources of polarizability in dielectrics.
11. Explain the domain theory of ferromagnetic materials.
12. What do you mean by a thermodynamic process? Distinguish between isochoric and isobaric processes.
13. Using a suitable block diagram, discuss the working principle of a refrigerator. What is meant by the term co-efficient of performance of a refrigerator?
14. State the third law of thermodynamics. What is its physical significance?
15. What are the postulates of special relativity?
16. Discuss the phenomenon of time dilation. (2 x 6 = 12)

**PART C** (Problem/Derivations)**Answer any four questions. Each question carries 5 Marks**

17. A rod of magnetic material 0.2 m long, 10 mm diameter and of relative permeability 1000 is placed inside a long solenoid wound with 300 turns/m. If a current of 0.5 A is passed through the rod, determine the magnetic moment of the rod.
18. A quantity of dry air at 300 K is compressed suddenly to one third of its volume. Determine the change in temperature. Given,  $\gamma = 1.4$ .

19. A Carnot engine whose low temperature reservoir is at 7 degree Celsius has an efficiency of 50 %. If it is desired to increase the efficiency to 70 %, by how many degrees should the temperature of the high temperature reservoir be increased?
20. One mole of oxygen gas expands isothermally to four times of its volume. Determine the change in entropy. Given, the gas constant  $R=8.314 \text{ J/mol/K}$ .
21. How fast a spaceship is moved for its length to be contracted to 90 % of its length at rest?
22. An electron and a positron practically at rest come together and annihilates. Estimate the energy released. (5 x 4 = 20)

**PART D (Essay)**

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

23. Obtain the Gauss's law in presence of a dielectric medium.
24. Explain the Carnot cycle with a neat PV diagram. Obtain an expression for the work done in a Carnot cycle.
25. Discuss the origin of ferromagnetic domains. What do you mean by magnetic hysteresis? Draw a typical hysteresis curve and explain the terms retentivity and coercivity. How is the area of the hysteresis curve related to the energy dissipated per unit volume of the material during each magnetic cycle?
26. Obtain the Lorentz co-ordinate and time transformation equations. (10 x 2 = 20)

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