

TB162530B

Reg. No:

Name:

B. Sc. DEGREE (C.B.C.S.S.) EXAMINATION, MARCH 2017
(2016 Admission – Regular & 2015 Admission – Supplementary/Improvement)
SEMESTER II - COMPLEMENTARY COURSE (PHYSICS)
PH2CM2TB - 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. Define the term magnetic susceptibility.
2. What are the basic requirements for a system to be in thermodynamic equilibrium?
3. What is Clausius statement of the second law of thermodynamics?
4. State the principle of increase of entropy.
5. Are two simultaneous events occurring at the same point simultaneous in all inertial frames. Why?

(5x1=5)

PART B

II. Answer any five questions. Each question carries 2 marks.

6. Based on a typical hysteresis curve, compare the properties of soft iron and steel.
7. Discuss the ordering of dipoles in antiferromagnetic and ferrimagnetic materials.
8. Show that in an isothermal process, the heat supplied to an ideal gas is equal to the work done by the gas.
9. What do you mean by isochoric and isobaric processes?
10. Using a suitable block diagram, discuss the working principle of a refrigerator. What is meant by the term co-efficient of performance?
11. Discuss the effect of pressure on the melting point of a solid and boiling point of a liquid.
12. What are the postulates of special relativity?
13. What do you mean by the term proper length and proper time?

(5x2=10)

PART C

III. Answer any five questions. Each question carries 5 marks

14. An iron rod of area of cross-section 0.5 cm^2 is subjected to a magnetizing field of 1000 Am^{-1} . If the susceptibility of iron is 599, determine the permeability of the specimen and magnetic induction.
15. 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.
16. A quantity of dry air at 300 K is compressed suddenly to one third of its volume. Determine the change in temperature. Given, $\gamma = 1.4$.

17. Show that the adiabatic elasticity of a gas is γ times that of the isothermal elasticity.
18. 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?
19. One mole of oxygen gas expands isothermally to four times of its volume. Determine the change in entropy. Given, the gas constant $R=8.314 \text{ J/mol/K}$.
20. How fast a spaceship is moved for its length to be contracted to 90 % of its length at rest?
21. An electron and a positron practically at rest come together and annihilates. Estimate the energy released.

(5x5=25)

PART D

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

22. Discuss the features of diamagnetic, paramagnetic and ferromagnetic materials. Explain diamagnetism, paramagnetism and ferromagnetism using the electron theory of matter.
23. Explain the Carnot cycle with a net PV diagram. Obtain expression for the work done in a Carnot cycle.
24. Define the term entropy. Derive an expression for the entropy of an ideal gas in terms of temperature, volume and specific heat. Prove that the entropy change in a reversible cyclic process is zero.
25. Obtain the Lorentz transformation equations. Prove that for small velocities, they reduce to the Galilean transformation equations.

(2x10=20)