



**WEST BENGAL STATE UNIVERSITY**

B.Sc. Honours 2nd Semester Examination, 2021

**ELSACOR04T-ELECTRONICS (CC4)**

Time Allotted: 2 Hours

Full Marks: 40

*The figures in the margin indicate full marks.  
Candidates should answer in their own words and adhere to the word limit as practicable.  
All symbols are of usual significance.*

**GROUP-A**

1. Answer any **five** questions from the following: 2×5 = 10
- (a) State Heisenberg's uncertainty principle.
  - (b) What is the physical significance of wave function?
  - (c) Define ensemble.
  - (d) What do you mean by microstate and macrostate?
  - (e) What are fermions?
  - (f) State zeroth law of thermodynamics.
  - (g) Define mean free path.
  - (h) How magnetic materials are classified based on magnetic moment?

**GROUP-B**

**Answer any six questions from the following**

**5×6 = 30**

2. Derive an expression of Compton Shift of wavelength of scattered photons. 5
3. A particle of mass  $m$  is confined in a one dimensional potential box of rigid wall of width  $w$ . 5  
Find the stationary energy levels and the energy eigen-functions.
4. (a) Explain the physical significance of wave function. 2  
(b) Prove that  $[L^2, L_x] = 0$  3
5. Prove the Boltzmann relationship between entropy  $S$  and thermodynamic probability  $W$ . 5

6. Starting from basic assumptions, derive the Bose-Einstein distribution law. 5
7. Under what condition do BE-distribution and FD-distribution function approach MB-distribution? Represent graphically. 5
8. Starting from Planck's law of black body radiation deduce Rayleigh Jeans law and Wien's law. 5
9. Prove that for the perfect gas  $C_p - C_v = R$ ; where  $C_p$  and  $C_v$  are molar specific heat of gas. 5
- 10.(a) Why does the adiabatic curve steeper than the isothermal curve? 2
- (b) Isothermally at  $27^\circ\text{C}$  one mole of a Van der Wall's gas is expanded from 2 litre to 20 litre. Calculate the work done by the gas. Given that  $a = 1.42$  and  $b = 0.03$ . 3
11. Write short note on any **one** of the following: 5
  - (a) Ferromagnetism.
  - (b) Resistivity of metals.

**N.B. :** *Students have to complete submission of their Answer Scripts through E-mail / Whatsapp to their own respective colleges on the same day / date of examination within 1 hour after end of exam. University / College authorities will not be held responsible for wrong submission (at in proper address). Students are strongly advised not to submit multiple copies of the same answer script.*

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