E 2940

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Reg. No.....

Name.....

B.Sc. DEGREE (C.B.C.S.S.) EXAMINATION, APRIL 2022

Fifth Semester

Core Course—THERMAL AND STATISTICAL PHYSICS

(Common for Model I and Model II B.Sc. Physics, B.Sc. Physics EEM and B.Sc. Physics Instrumentation)

[2013 to 2016 Admissions]

Time : Three Hours

Maximum Marks : 60

Part A

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

1. State the Zeroth law of thermodynamics.
2. What is an adiabatic ?
3. What is meant by reversible process ?
4. What is a T-S diagram ?
5. What is Gibbs function ?
6. What are the merits of Lee's method ?
7. Define the term microstates.
8. State the characteristics of bosons.

(8 × 1 = 8)

Part B

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

9. How isothermal process is different from adiabatic process ?
10. Explain the various aspects of irreversible process.
11. What is an Otto cycle ?
12. Draw the indicator diagram for diesel cycle.
13. What is meant by unattainability of absolute zero ?
14. Write down the Clausius-Clapeyron equation.
15. Show that entropy remains constant in a reversible process.
16. What is meant by adiabatic elasticity ?

Turn over

17. Write down the expression for F-D distribution.

18. What is Fermi energy ?

(6 × 2 = 12)

Part C

Answer any **four** *questions.*
Each question carries 4 *marks.*

19. One mole of Helium of 300 K is compressed adiabatically so that its pressure increases to 10 times of its initial value. Calculate the final temperature, $\gamma = 1.67$.

20. A certain volume of gas at 365 K expands isothermally until its volume is doubled. Calcualte the work done.

21. Calculate the efficiency of an engine working between 227° C. and 15° C.

22. Water boils at temperature of 101° C. at a pressure of 787 mm of Hg. One gram of water occupies 1601 $cm.^3$ on evaporation. Calculate the latent heat of steam.

23. Find the Fermi energy in copper on the assumption that each copper atom contributes one free electron to the electron gas.

24. Apply the distribution law to a photon gas.

(4 × 4 = 16)

Part D

Answer any **two** *questions.*
Each question carries 12 *marks.*

25. Describe with diagram the working of petrol engine and deduce an expression for its efficiency.

26. Derive Maxwell's thermodynamic relations.

27. Discuss FD statistics for distribution equation with limitations.

28. Bring out the fundamentals of statistical mechanics. Obtain the relation between thermodynamic probability and entropy.

(2 × 12 = 24)