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B.Sc. III Semester (CBCS) Degree Examination

PHYSICS

Thermal Physics and Statistical Mechanics

Paper : DSC 3

(New)

Time : 3 Hours **Maximum Marks : 80**

Instructions to Candidates:

1. Answer **all** the questions
2. Draw **diagrams** wherever necessary

I. Answer any TEN of the following in Two or Three sentences. **(10×2=20)**

1. Define irreversible process, Give example.
2. State second law of Thermodynamics
3. What is refrigerator? Name two refrigerants.
4. Define Internal energy and enthalpy of a system
5. What is the change in entropy for reversible and irreversible processes?
6. State the law of equipartition of energy.
7. On what factors the coefficient of viscosity of gas depends?
8. Define Emissive power and absorptive power.
9. What are the differences between Bosons and Fermions?
10. Define μ - space and Γ- space
11. State Stefan- Boltzmann Law. Write the value of Stefan constant.
12. Define entropy. Mention its two properties.

II. Answer any Four of the following. **(4×5=20)**

13. Derive the expression for workdone during adiabatic process.
14. Show that the change in entropy in reversible process is zero.
15. Deduce Wien's displacement law from Planck's law of radiation.
16. Explain Black-Body radiation spectrum with neat diagram.
17. Deduce the Boltzman entropy probability relation $S=K \log_e w$.
18. Compare, Maxwell-Boltzman, Bose-Einstein and Fermi-Dirac statistics.

III. Answer any Four of the following. **(4×10=40)**

19. a) Describe the working of Carnot's engine. Obtain an expression for the efficiency. **(8+2)**

    b) The efficiency of Carnot engine is 50%. When the temperature of the sink is 300K. Find the temperature of the source.

20. Obtain Maxwell's equations in Thermodynamics **(10)**

21. a) Obtain an expression for thermal conductivity of a gas on the basis of Kinetic theory of gases. **(7+3)**

    b) Find the temperature at which the root mean square velocity of the molecules of a gas would become twice its value at 100^0C.

22. a) Derive Planck's law of radiation. **(8+2)**

    b) Calculate the wavelength at which human body radiates maximum energy. Take body temperature at 37^0C and Wien's constant $b=2.898\times10^{-3}$mk

23. Deduce Clausius-Clapeyron equation from Maxwell's Thermodynamical relations. Explain its applications. **(10)**

24. Derive Bose-Einstein Distribution law. **(10)**
