

[This question paper contains 3 printed pages]

5223

Your Roll No

B Sc. Prog./II

J

MP-202 Thermal Physics & Electromagnetism

(Admissions of 2005 and onwards)

Time 3 Hours

Maximum Marks 75

(Write your Roll No on the top immediately
on receipt of this question paper)

Attempt any five questions
All questions carry equal marks

1 (a) Define reversible and irreversible processes ? Give examples of each (3,3)

(b) State Zeroth and first law of thermodynamics
Use first law of thermodynamics, show that for one mole of perfect gas

$$C_p - C_v = R$$

where the symbols have their usual meaning

(2,2,5)

2 (a) Distinguish between Maxwell-Boltzmann, Fermi-Dirac and Bose-Einstein statistics (6)

P T O

5223

2

- (b) Using Fermi-Dirac distribution law, show that for a completely degenerate ideal fermi gas of 'N' particles, the mean energy is given by

$$E = \frac{3}{5} N \epsilon_F(0)$$

where the symbol's have their usual meaning (9)

- 3 Using the Maxwell's law of the distribution of velocities in an ideal gas, derive the expression for the following

- (i) Average speed \bar{V}
- (ii) Root mean square V_{rms}
- (iii) Most probable speed V_m (15)

- 4 (a) Show that Rayleigh-Jean's law and Wein's law of Black body radiation are special case of planck's law (9)

- (b) Obtain an expression for Sten-Boltzmann constant (6)

- 5 State and explain Biot-Savart law and show that

(i) $\nabla \cdot \vec{B} = 0$ Explain its significance

(ii) $\nabla \times \vec{B} = \mu_0 \vec{J}$

where symbols have their usual meaning (3,6,6)

5223

3

- 6 (a) Find the force between two straight infinite parallel wire carrying current I_1 and I_2 separated by a distance 'd' and placed in vacuum (7)
- (b) Using Gauss's law find the electric field intensity between two infinite rectangular planes carrying surface charge densities σ and $-\sigma$ respectively (8)
- 7 Discuss the propagation of electromagnetic waves in dilute ionized plasma. Obtain an expression for refractive index and plasma frequency (8,7)
- 8 Write short notes on any two of the following
- (a) Law of equipartition of energy
- (b) Maxwell's Modification of Ampere's law
- (c) Thermodynamic potentials
- (d) Poynting's theorem (7½, 7½)

(300)****

HowToExam.com