OR

13. (p) Explain the terms :

(i) R.M.S. value of alternating current

(ii) Average value of alternating current. 4

(q) Deduce an expression for power consumed in an a.c. circuit. 6

(r) Explain any two losses in the transformer. 2

AP–422

B.Sc. Part–I (Semester–II) Examination

2S : PHYSICS

(Kinetic Theory, Thermodynamics and Electric Currents)

Time—Three Hours] [Maximum Marks—80

N.B. :— (1) All questions are compulsory.

(2) Draw neat and well labelled diagram wherever necessary.

1. (A) Fill in the blanks : 2

(i) Mean Free Path of the gas molecule is _____ proportional to the pressure of gas.

(ii) The transformer which converts low a.c. voltage into high a.c. voltage is called _____.

(iii) $dQ = T.ds$ is the mathematical form of _____ law of thermodynamics.

(iv) Maximum power is transferred from the source to load when the _____ of the source is equal to the load resistance.

(B) Choose the correct alternative : 2

(i) A particle having charge 'q' when moving through a potential difference v acquires energy :

(a) $\frac{q}{v}$ (b) $q + v$

(c) $q \cdot v$ (d) $q - v$

(ii) The total heat content of the substance is known as _____.

(a) Internal energy (b) Enthalpy

(c) Thermal capacity (d) Entropy

(iii) The number of degrees of freedom for monoatomic gas is :

(a) 3 (b) 5

(c) 7 (d) 6

(iv) When constant emf is applied to a series L – R circuit, current in it increases _____.

(a) Abruptly (b) Linearly

(c) Exponentially (d) None of these

(C) Answer in **one** sentence : 4

(i) What is critical coefficient ?

(ii) State Zeroth law of thermodynamics.

(iii) What is power factor ?

(iv) What is alternating current ?

OR

9. (p) Explain the principle, construction and working of Bainbridge mass spectrograph. 6

(q) Explain the motion of charge particles in a uniform transverse magnetic field. 4

(r) Give the principle of linear accelerator. 2

EITHER

10. (a) State and prove superposition theorem. 6

(b) Give the construction and theory of Ballistic galvanometer. 6

OR

11. (p) Obtain an expression for decay of charge in C-R Circuit when constant source of emf is removed from the circuit. 6

(q) State and prove maximum power transfer theorem. 6

EITHER

12. (a) Using j-operator method, derive an expression for admittance of parallel L-C-R circuit. 6

(b) Explain the construction and theory of an Ideal transformer. 6

EITHER

2. (a) Derive van der Waal's equation of state. 5

(b) State and prove law of equipartition of energy. 5

(c) Deduce Boyle's Law from the expression of pressure exerted by gas on the basis of kinetic theory of gases. 2

OR

3. (p) Give the interpretation of temperature on the basis of kinetic theory of gases. 4

(q) Obtain an expression for 'Mean Free path' of particle. 3

(r) Derive an expression for coefficient of viscosity of a gas on the basis of transport phenomenon. 5

EITHER

4. (a) Explain :

(i) Reversible process

(ii) Irreversible process.

Give examples of each process. 3

(b) State and prove Carnot's theorem. 5

(c) Show that the total change in entropy of the working substance in complete reversible process is zero. 4

OR

5. (p) Explain the S–T diagram and hence show that area of rectangle on this diagram is equal to the work done for Carnot's cycle. 6

(q) Explain :

(i) Isobaric process

(ii) Free expansion. 4

(r) Find the efficiency of Carnot's engine working between the steam point and ice point. 2

EITHER

6. (a) What is Joule-Thomson effect ? Explain the porous-plug experiment. 6

(b) What are Extensive thermodynamic variables and Intensive thermodynamic variables ? Give two examples of each. 4

(c) Define :

(i) Inversion temperature

(ii) Boyle's temperature. 2

OR

7. (p) Derive Clausius-Clapeyron heat equation. 6

(q) Explain the method of the lique-faction of Helium. 6

EITHER

8. (a) Explain the principle, construction and working of cyclotron. 6

(b) What is velocity selector ? Explain its working. 4

(c) What is electron gun ? 2