AU–56

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

2S : PHYSICS

(Kinetic Theory, Thermodynamics and Electric Currents)

Time : Three Hours] [Maximum Marks : 80

Note :— (1) **ALL** questions are compulsory.

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

1. (A) Fill in the blanks :

(i) Current density is a _____ quantity.

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

(iii) S.I. unit of specific heat is _____.

(iv) A region where an electric charge experience a force called as _____. 2

(B) Choose the correct alternative :

(i) The total heat of substance is known as :

(a) Internal energy (b) Enthalpy

(c) Thermal energy (d) Entropy

(ii) Thevenin equivalent circuit gives :

(a) Voltage equivalent source (b) Current equivalent source

(c) Both (a) and (b) (d) None of these

(iii) The rms value of a sinusoidal ac current is equal to :

(a) Peak value/$\sqrt{2}$ (b) $\sqrt{2}$ × Peak value

(c) $\sqrt{2}$ /Peak value (d) None of these

(iv) Velocity of the particle from velocity selector is equal to :

(a) E/B (b) B/E

(c) E (d) B 2

(C) Answer in a one sentence :

(i) What is network ?

(ii) Define specific heat.

(iii) What is entropy ?

(iv) Define mutual inductance. 4

EITHER

2. (A) Define :

(i) Degrees of Freedom

(ii) Mean free path. 2

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

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

OR

3. (P) State any four assumptions of kinetic theory of gases. 2

(Q) Show that the mean free path of a molecule is inversely proportional to the density of gas. 5

(R) Deduce an expression for coefficient of viscosity of a gas in terms of mean free path. 5

EITHER

4. (A) State the second law of thermodynamics. 2

(B) Explain the terms :

(i) Reversible process

(ii) Irreversible process. 4

(C) Describe Carnot's cycle and deduce an expression for its efficiency. 6

OR

5. (P) What is P-V indicator diagram ? 2

(Q) Show that the ratio of two temperature on the thermodynamic scale is equal to the ratio of heat absorbed and heat rejected by an engine. 4

(R) State and prove Carnot's theorem. 6

EITHER

6. (A) Describe the method for the liquefaction of hydrogen using Joule-Thomson effect. 6

(B) Derive Maxwell's equation :

$$\left(\frac{\partial S}{\partial V}\right)_T = \left(\frac{\partial P}{\partial T}\right)_V .$$ 6

OR

7. (P) Describe Joule-Thomson's porous plug experiment. 6

(Q) Describe the method for the liquefaction of helium. 6

EITHER

8. (A) Describe the motion of charged particle in a uniform transverse magnetic field. 4

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

(C) An electron is introduced in the electric field setup between two parallel plates. The potential difference and distance between plates is 1000 Volt and 0.5 cm respectively. Find the force experienced by an electron. ($e = 1.6 \times 10^{-19}$ C) 2

OR

9. (P) Explain the principle, construction and working of Bain bridge mass spectrograph. 6

(Q) Describe the motion of charged particle in transverse electric field. 4

(R) An electron beam passes through a magnetic field of 2×10^{-3} wb/m^2 and electric field of 3.4×10^4 volt/m, both acting simultaneously at the same point. If the path of electron remains undeviated, calculate the speed of electrons. 2

EITHER

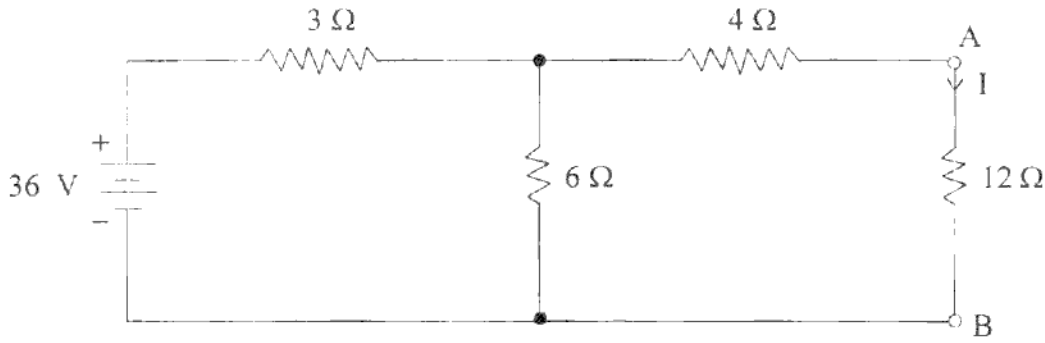
10. (A) State and prove Maximum Power Transfer Theorem. 6

(B) Obtain an expression for decay of current in L-R circuit when source of constant e.m.f. is removed. 6

OR

11. (P) State and explain Superposition theorem. 6

(Q) Using Thevenin's theorem, calculate the current through the 12 Ω resistance of the given circuit 4



(R) State the growth of charge in C-R circuit, hence define the time constant of C-R circuit. 2

EITHER

12. (A) Define :

(i) Capacitive reactance

(ii) Inductive reactance. 2

(B) State and explain the energy loses in a transformer. 4

(C) Using j-operator method obtain an expression for the current and impedance in series L-R circuit when ac is applied to it. 6

OR

13. (P) What is transformer ? Explain the principle, construction and working of transformer. 6

(Q) Derive an expression for the average power in an a.c. circuit. 4

(R) What is parallel resonant circuit ? 2