2022

Time - 3 hours

Full Marks - 60

Answer **all groups** as per instructions.
Figures in the right hand margin indicate marks.

GROUP - A

1. Answer <u>all</u> questions and fill in the blanks as required. [1 × 8

   (a) Write the S.I. unit of Gravitational potential.

   (b) Viscosity of a fluid depends on temperature. (True / False)

   (c) Is critically damped motion oscillatory ? (Yes / No)

   (d) The velocity of transverse wave in a string is proportional to T^n. What is the value of n ?

   (e) The efficiency of a Carnot's engine is 1.5. (True / False)

   (f) The reflective power of Black body is _____.

   (g) What is the S.I. unit of time constant in RC circuit ?

   (h) P-type semiconductor is positively charged. (Yes / No)

GROUP - B

2. Answer <u>any eight</u> of the following within two or three sentences each.   [1½ × 8

    (a) Define Radius of gyration and write its unit.

    (b) Define Surface Tension. Is it dependent on temperature ?

    (c) What is damped Harmonic motion ?

    (d) Define longitudinal and transverse wave with examples.

    (e) State the law of principle of increase of entropy.

    (f) Define co-efficient of Thermal conductivity.

    (g) Write the Maxwell's thermodynamic relations.

    (h) Draw circuit symbols of PNP and NPN transistors.

    (i) Draw vector impedance diagram.

    (j) Define Lorentz force law.

GROUP - C

3. Answer <u>any eight</u> of the following within 75 words each.   [2 × 8

    (a) State and explain parallel axis theorem.

    (b) Define the elastic constants : Young's Modulus, Bulk Modulus and Modulus of Rigidity.

(c) What is Resonance in Forced Vibration ?

(d) The displacement y = 20 sin (5x – 100 t). Find the amplitude, wavelength and frequency from above equation.

(e) Write the equivalency of Kelvin Planck statement and Clausius statement.

(f) What is Black body ? Write the Planck's radiation formula.

(g) What is a heat engine ? Find the efficiency of a Carnot's engine working between 27^0 C and 127^0 C.

(h) Derive differential form of Ampere's circuital law.

(i) Derive relation between α and β in transistors.

(j) What do you mean by resonance in LCR circuit and find the condition for resonant frequency ?

GROUP - D

Answer *any four* questions within 500 words each. [6 × 4

4. What is Moment of Inertia ? Find the M.I. of a solid sphere about its diameter.

5. Derive the Poiseuille's formula for a liquid.

6. Find the solution by establishing the equation of motion for damped Harmonic motion. Discuss the conditions for overdamped, under-damped and critically damped motion.

P.T.O.

7. State and prove Carnot's theorem.

8. Using Maxwell's thermodynamic relations, derive the Clausius Clapeyron equation.

9. Use Biot Savart's law, to find the magnetic induction at the centre of a current carrying circular coil.

10. What is Rectifier ? Discuss the construction and working of full wave rectifier (Bridge type). Find its efficiency.