D1BPH1902 (S5)   Reg. No..............................

Name: ....

FIRST SEMESTER B.Sc. DEGREE EXAMINATION, NOVEMBER 2024
(Improvement/Supplementary)
PHYSICS: COMPLEMENTARY COURSE FOR MATHEMATICS & CHEMISTRY
GPHY1C01T: PROPERTIES OF MATTER AND THERMODYNAMICS

Time: 2 Hours   **Maximum Marks: 60**

SECTION A: Answer the following questions. Each carries *two* marks.
(Ceiling 20 marks)

1. State Clausius statement of second law of thermodynamics.
2. Write down Clausius -Clapyron equation and explain the terms used.
3. Give two examples which show that entropy is related to disorder of the system.
4. What is meant by quasistatic process?
5. Show that the total entropy change during Carnot cycle is zero.
6. What is meant by torsional rigidity? Give the expression for torsional rigidity and explain the symbols used.
7. What are I section girders? What is its advantage? Mention one example.
8. Derive an expression for the work done in blowing a bubble.
9. Explain the effect of temperature on surface tension.
10. What is Brownian motion?
11. Compare the schematic diagram of a heat engine and a refrigerator.
12. What is meant by Poisson's ratio? Give the limiting values of Poisson's ratio. Why Poisson's ratio cannot have negative values?

SECTION B: Answer the following questions. Each carries *five* marks.
(Ceiling 30 marks)

13. Calculate the work done by a hydrostatic system during an isothermal and adiabatic process.
14. Calculate the change in entropy when 1 kg of ice at its melting point is converted into water and heated to 283_K. Specific latent heat of ice=3.35×10^5 J/kg. Specific heat capacity of water=4180 J/kg/K.
15. Derive an expression for the bending moment of a horizontal beam fixed at one end and loaded at the other end.
16. Calculate the energy needed to break a drop of liquid of volume $10^{-6}\,m^3$ into 1000 million drops of equal size. Surface tension of the liquid is $26 \times 10^{-6}\,N/m$.
17. Explain the meaning of terminal velocity as applied to the motion of a sphere falling through a viscous liquid. Derive an equation to show the relation between the terminal velocity of the sphere and its radius.

18. A heat engine working between two temperatures can convert 12.5% of heat to useful work. When the temperature of the sink is reduced by 95°C, the efficiency is doubled. Find the temperature of source and sink.

19. A gold wire 3.2×10^{-4} m in diameter elongates by 10^{-3}m, when stretched by a force of 0.33 kgwt. and twists through 1 radian when equal and opposite torques of 145×10^{-7} Nm are applied at its ends. Find the value of Poisson's ratio for gold.

SECTION C: Answer any *one* question. The question carries *ten* marks.

20. Derive Poiseuille's formula for the rate of flow of a liquid through a capillary tube. What are the limitations of this formula?

21. With the help of indicator diagram describe the working of a Carnot engine. Derive an expression for its efficiency.

(1 × 10 = 10 Marks)