**QP Code: U25DRIS054**

**Reg. No : .....**

**Name : .....**

# ST MARY'S COLLEGE (AUTONOMOUS), THRISSUR-20

## I SEMESTER (FYUGP) DEGREE EXAMINATIONS, NOVEMBER 2025

**(Regular/Improvement/Supplementary)**

**PHY1MN102 : Properties of Matter and Thermodynamics**

**2024 Admission Onwards**

**(Credits: 4)**

**Time: 2 Hours** **Maximum Marks: 70**

### Section A

*Answer **all**. Each question carries **3** Marks.* ***(Ceiling: 24 Marks)***

1. Define Poisson's ratio. Discuss its range and physical significance.
2. Explain strain and give the different types of strains.
3. Define the centre of mass of a body and explain its physical significance.
4. Define buoyant force and list two practical applications in daily life and industry.
5. How does absolute pressure differ from gauge pressure? Explain with reference to a pressure-measuring device.
6. What is Thermal Equilibrium ?
7. Apply First Law of Thermodynamics for isolated systems.
8. Define thermodynamic equilibrium and describe the different types of equilibrium involved.
9. Define a cyclic process in thermodynamics and explain its characteristics.
10. Discuss the relation between entropy and available energy.

### Section B

*Answer **all**. Each question carries **6** Marks.* ***(Ceiling: 36 Marks)***

11. Derive the expression for position vector of centre of mass of two particle system.
12. A body of volume $10^{-3}m^3$ is pressed by a pressure of $4x10^4Nm^{-2}$. Its volume decreases by $0.2x10^{-6}m^3$. Calculate the bulk modulus of the body.
13. What will happen if a polystyrene block, a wooden block, and an iron block of the same volume dropped in water ?
14. Water flows through a horizontal capillary tube of 1mm diameter and length 70cm under pressure of a column of water 30cm in height. Find the rate of flow of water through the tube. $\eta = 10^{-3}Nm^{-2}s$.

**Turn Over**

15. Explain the sign conventions used in thermodynamic processes.
16. Calculate the work done when one gram molecule of an ideal gas expands isothermally at $27^0$C to double its original volume. R = 8.3 $JK^{-1}mole^{-1}$.
17. Calculate the entropy change in a Carnot cycle.
18. Define a heat engine and derive an expression for its thermal efficiency.

## Section C

*Answer **any one**. Each question carries **10** Marks.* ***(1x10=10marks)***

19. Obtain Meyer's relation connecting specific heats.
20. Explain the four stages of Carnot's cycle and derive the expression for the efficiency of an ideal Carnot engine operating between two thermal reservoirs.

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