

**QP Code:U24A071**

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

**Name** : .....

**ST MARY'S COLLEGE (AUTONOMOUS), THRISSUR-20**  
**I SEMESTER B.A. / B.Sc / B.Com / BSW (FYUGP) DEGREE EXAMINATION,**  
**November 2024**

**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. What is meant by centre of mass of a body? [BTL1]
2. Distinguish between cohesive force and adhesive force. [BTL2]
3. How would you analyze the different types of stress? [BTL4]
4. How do the concepts of working stress and factor of safety interact, and how would you analyze their roles in determining the structural safety of a mechanical design? [BTL4]
5. How can the relationship between high cholesterol and high blood pressure be explained in the context of a patient's cardiovascular health? [BTL3]
6. What is Thermodynamic Equilibrium? [BTL1]
7. Most cooking involves isobaric process. Why? [BTL4]
8. Explain the concept of adiabatic cooling with an example. [BTL2]
9. Explain the Third Law of Thermodynamics and describe absolute zero. [BTL3]
10. How would you apply the sign convention for entropy changes? [BTL3]

**Section B**

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

11. Find the rigidity modulus and bulk modulus of copper. Given  $Y=1.2 \times 10^{11} \text{ Nm}^{-2}$ ,  $\sigma = 0.25$  [BTL3]
12. Draw a stress-strain graph and explain in detail? Identify the material's elastic and plastic regions. [BTL2]

**Turn Over**

13. Explain Pascal's law with examples. [BTL1]
14. In giving a patient a blood transfusion, the bottle is setup so that the level of blood is 1.3m above the needle which has an internal diameter of  $3.6 \times 10^{-4} \text{m}$  and is 0.03m in length. If  $4.5 \times 10^{-6} \text{m}^3$  of blood passes through the needle in one minute, calculate the viscosity of blood, if its density is  $1020 \text{kgm}^{-3}$  [BTL4]
15. Prove that work done in a Thermodynamic Process depends on the path. [BTL3]
16. Calculate the work done when one gram molecule of an ideal gas expands isothermally at  $27^\circ\text{C}$  to double its original volume.  $R=8.3 \text{ JK}^{-1}\text{mol}^{-1}$  [BTL4]
17. The efficiency of an ideal engine is 0.2. If the temperature of the sink is lowered by  $20^\circ\text{C}$ , efficiency becomes 0.25. Find the temperature of the source and sink. [BTL4]
18. A Carnot's engine working as a refrigerator between 260K & 300K receives 500 calories of heat from the reservoir at the lower temperature. Calculate the amount of heat rejected to the reservoir at the higher temperature. Calculate the work done. [BTL5]

### Section C

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

19. Derive Meyer's Relation. [BTL4]
20. Derive Bernoulli's Equation and mention any of its applications. [BTL4]

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