

--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

**B.M.S COLLEGE FOR WOMEN**  
BENGALURU – 560004

**I SEMESTER END EXAMINATION – JAN/FEB-2024**

**B.Sc – PHYSICS: MECHANICS & PROPERTIES OF MATTER**  
(NEP Scheme 2021-22 onwards F + R)

**Course Code: PHY1DSC01**  
**Duration: 2 ½ Hours**

**QP Code:1013**  
**Max marks: 60**

**PART – A**

**Answer ALL questions. Each question carries ONE Mark (5x1=5)**

- The dimensional formula for moment of inertia is  
a)  $[ML^0T]$    b)  $[M^2LT]$    c)  $[ML^2T^0]$    d)  $[MLT^2]$
- The orbital velocity of a planet when it approaches the Sun  
a) increase   b) decrease   c) remain constant   d) become zero
- Period of the geostationary satellite is  
a) 42 Hrs   b) 24 Hrs   c) 12 Hrs   d) 6 Hrs
- Speed of a liquid passing through a pipe of reducing radius  
a) become zero   b) does not change   c) decrease   d) increase
- Moment of inertia of a disc of radius  $r$  and mass  $m$  rotating with an axis passing through centre and perpendicular to its plane is  
a)  $mr^3$    b)  $mr^2$    c)  $\frac{1}{2} mr^2$    d)  $\frac{1}{2} mr^3$

**PART – B**

**Answer any THREE questions. Each question carries TEN Mark (3x10=30)**

- Obtain the expressions for length contraction and time dilation. (10)
- a) Give the relation between torque and angular momentum.  
b) Deduce the expression for moment of inertia of rectangular lamina. (2+8)
- a) Arrive at an expression for the depression in a loaded single cantilever.  
b) State Kepler's laws of planetary motion. (7+3)
- Obtain the expression for pressure difference across a curved liquid surface. (10)
- a) Show that areal velocity is constant in a central force field.  
b) Derive an expression for viscosity by Poiseuille's method. (4+6)

**PART – C**

**Answer any THREE questions. Each question carries FIVE Mark**

**(3x5=15)**

11. A fully fueled rocket of mass 5000 kg is set to be fired vertically. If the rocket ejects its gases at a speed of  $3 \times 10^3 \text{ms}^{-1}$  with respect to the rocket and burns fuel at the rate of  $50 \text{kg s}^{-1}$ , what is the rocket's initial upward acceleration? Include the effect of gravity.
12. Transform the displacement vector  $(4\hat{i} + 3\hat{j})$  cm in a system S to S' when S' moves with a velocity of  $0.8c\hat{i}$  relative to S.
13. A fly wheel of mass 2.5 kg and a diameter of 0.16 m makes 25 revolutions per minute. Find its kinetic energy.
14. A steel wire of radius 1mm is bent into an arc of a circle of radius 0.5 m. Calculate  
i) Bending moment and ii) Maximum stress. Given:  $q = 20 \times 10^{10} \text{Nm}^{-2}$ .
15. Calculate the work done in spraying a spherical drop of mercury of radius  $10^{-3} \text{m}$  into a million drops of equal size. Given: surface tension of mercury =  $550 \times 10^{-3} \text{Nm}^{-1}$ .

**PART – D**

**16. Answer any FIVE questions. Each question carries TWO Mark**

**(5x2=10)**

- a) Distinguish between fundamental and derived units.
- b) If velocity, time and force are chosen as basic quantities, find the dimensions of mass.
- c) Newton's first law gives the definition of force. Explain.
- d) Two bodies A and B has same momentum. If A is heavier than B, which one of them has larger kinetic energy? Explain.
- e) Distinguish between elastic and plastic materials.
- f) Poisson's ratio cannot be negative. Explain.
- g) A drop of liquid takes spherical shape. Give reason.
- h) What are the factors on which the terminal velocity depends?

\*\*\*\*\*

BMSCW LIBRARY