Reg.No.............................

Name: ....

FIRST SEMESTER B.Sc DEGREE EXAMINATION, NOVEMBER 2022
(Regular/Improvement/Supplementary)
PHYSICS
GPHY1B01T: MECHANICS - I

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

SECTION A: Answer the following questions. Each carries 2 marks.
(Ceiling 20 marks)

1. What is meant by radius of gyration?
2. State and explain Hooke's law.
3. Define normal force and frictional force.
4. Write down the conditions for weight gain and weight loss of a turtle in an elevator.
5. What is a conical pendulum? Write the expression for its time period?
6. How will you find the centre of mass of an extended body?
7. What is a conservative forces? Give one example.
8. Define power. What is its unit?
9. What is meant by potential well?
10. Write down the dynamical formula for angular momentum L_z, torque τ_z and kinetic energy K for an object involving rotation and translation.
11. Rest and Motion are relative quantities. Justify the statement.
12. Obtain the expression for rotational kinetic energy of a rigid body starting from the kinetic energy of a particle in the body.

SECTION B: Answer the following questions. Each carries 5 marks.
(Ceiling 30 marks)

13. What is the necessary procedure to be followed to draw a free body force diagram?
14. Discuss the motion of Drum major's baton and locate its centre of mass.
15. A particle moves in a potential energy field $-Bx^2$. Find the expression for the force. At what point does the force vanish?
16. Calculate the work done by a uniform force.
17. Find the gravitational force due to a solid sphere at points i) outside the sphere ii) on the surface of the sphere and iii) inside the sphere.
18. A constant force of $10N$ acts on a particle having position vector $\vec{r} = 4\hat{\imath} + 2\hat{\jmath}$. If the force is along the y axis, calculate the torque on the particle about the origin. What is its direction?
19. Obtain the relation connecting the linear velocity $\vec{v}$ of a point having position $\vec{r}$ on a rigid body about an axis which is rotating with an angular velocity $\vec{\omega}$ about this axis.

SECTION C: Answer any 1 question. Each carries 10 marks.

20. State and explain Newton's three laws of motion using linear air track experiment.
21. Obtain the expression for the period of oscillations of a physical pendulum and extend that to obtain the expression for determining acceleration due to gravity 'g' using Kater's pendulum.

(1 x 10 = 10 Marks)