

(FOR THE CANDIDATES ADMITTED

SUBJECT CODE **23 UPS 507**

DURING THE ACADEMIC YEAR 2023-24 ONLY)

REG.NO.

N.G.M.COLLEGE (AUTONOMOUS) : POLLACHI

END-OF-SEMESTER EXAMINATIONS : NOVEMBER – 2025

B.Sc. – PHYSICS

MAXIMUM MARKS: 75

SEMESTER: V

TIME : 3 HOURS

**PART – III
MECHANICS**

SECTION – A (10 X 1 = 10 MARKS)

ANSWER THE FOLLOWING QUESTIONS. (K1)

1. Newton's First Law states that an object at rest or in uniform motion will remain so unless acted upon by a
a) torque b) net force c) impulse d) centre of mass
2. The angular momentum is ----- quantity.
a) vector b) scalar c) dimensionless d) all the above
3. The smallest possible number of variables to determine the configuration of a system is called
a) generalized coordinates b) degrees of freedom c) constraints d) velocity.
4. The Newton's law which gives the relation between mass($F = ma$) and acceleration is
a) Newton's first law b) Newton's second law
c) Newton's third law d) all the above
5. The Hamiltonian H represents
a) total energy. b) potential energy c) kinetic energy d) all the above.

ANSWER THE FOLLOWING IN ONE (OR) TWO SENTENCES. (K2)

6. Give the value of universal gravitational constant.
7. State parallel axis theorem .
8. What do you mean by conservation of energy?
9. What is D'Alembert's principle?
10. What does phase space mean?

(CONTD 2)

SECTION – B

(5 X 5 = 25 MARKS)

ANSWER EITHER (a) OR (b) IN EACH OF THE FOLLOWING QUESTIONS. (K3)

11. a) State and explain Newtonian law of Universal gravitation.
(OR)
b) What are conservative forces? Discuss the conservation of angular momentum.
12. a) State and prove perpendicular axis theorem with diagram.
(OR)
b) What is Torque? Deduce the expression for torque about centre of mass.
13. a) Explain the theorem for conservation of linear momentum.
(OR)
b) What are generalized coordinates? Explain the advantage of using them.
14. a) Deduce Newton's second law of motion from Hamilton's principle.
(OR)
b) Derive the period of oscillation of a simple pendulum using Lagrange's equation.
15. a) Describe Phase space and the motion of system.
(OR)
b) Explain the physical significance of H.

SECTION – C

(5 X 8 = 40 MARKS)

ANSWER EITHER (a) OR (b) IN EACH OF THE FOLLOWING QUESTIONS.

16. a) Explain the conservation of energy and work.
(OR)
b) Explain the conservation of angular momentum.
17. a) State and prove perpendicular axis theorem.
(OR)
b) Describe the theory of rotation about the fixed axis.
18. a) Obtain the expression for displacement and acceleration using generalized co-ordinates.
(OR)
b) List the various types of constraints and explain them with example.
19. a) Deduce Hamiltonian principle from D'Alembert's principle.
(OR)
b) Derive Lagrange's equation of motion from Hamiltonian principle.
20. a) Derive Hamiltonian canonical equation of motion in cylindrical coordinates systems.
(OR)
b) Obtain the expression for period of oscillation of compound pendulum using Hamilton's principle.