

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

END-OF-SEMESTER EXAMINATIONS : DECEMBER – 2022

M.Sc. – Physics

MAXIMUM MARKS: 50

I SEMESTER

TIME : 3 HOURS

CLASSICAL MECHANICS

SECTION – A

(10 X 1 = 10 MARKS)

ANSWER THE FOLLOWING QUESTIONS.

(K1)

1. The degrees of freedom for a free particle in space are -----
(a) one (b) two (c) three (d) zero
2. If the Lagrangian does not depend on time explicitly.....
(a) The Hamiltonian is constant (b) The Hamiltonian cannot be constant
(c) The kinetic energy is constant (d) the potential energy is constant
3. The Hamiltonian function is defined by
(a) $H=T+V$ (b) $H=T-V$ (c) $H=F+V$ (d) $H=F-V$
4. A rigid body has ----- independent motions
(a) 1 (b) 2 (c) 3 (d) 4
5. The equilibrium position of the system is said to be ----, if after a small disturbance the system does return to its original position.
(a) stable (b) unstable (c) neutral (d) none of these

ANSWER THE FOLLOWING IN ONE (OR) TWO SENTENCES.

(K2)

6. What are constraints?
7. Define phase space.
8. Write the Hamiltonian Jacobi equation.
9. What are the two types of motion of a rigid body?
10. What is the resonant frequency of the system?

SECTION – B

(5 X 3 = 15 MARKS)

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

11. a) Write a note on generalised coordinates.

(OR)

- b) Explain Hamilton's principle.

(CONTD.....2)

12. a) Discuss the significance of H.
(OR)
 b) Obtain the equations of motion in Poisson bracket form.
13. a) Derive Hamilton Jacobi equation.
(OR)
 b) Explain Hamilton's characteristic function.
14. a) Discuss Euler's angles.
(OR)
 b) Explain rotational kinetic energy of a rigid body.
15. a) What are known as stable and unstable equilibrium? Explain.
(OR)
 b) Explain normal coordinates of vibration.

SECTION – C**(5 X 5 = 25 MARKS)****ANSWER EITHER (a) OR (b) IN EACH OF THE FOLLOWING QUESTIONS.****(K4 (Or) K5)**

16. a) Find the Lagrange's equation of motion of the bob of a simple pendulum.
(OR)
 b) State and explain Euler Lagrange differential equation.
17. a) Obtain the Hamiltonian of a charged particle in an electro magentic field.
(OR)
 b) Explain the principle of least action.
18. a) Obtain the solution of Harmonic oscillator problem by the H-J method.
(OR)
 b) Obtain the solution of Harmonic oscillator problem in action angle variables.
19. a) Explain Euler's equation of motion for a rigid body.
(OR)
 b) Explain the force free motion of a rigid body.
20. a) Obtain the Lagrange's equation for small oscillations.
(OR)
 b) Explain normal frequencies of vibration. Deduce the Lagrangian equation of motion using normal co-ordinates.
