(FOR THE CANDIDATES ADMITTED

DURING THE ACADEMIC YEAR 2023 ONLY)

SUBJECT CODE 23PPS102

REG.NO.

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

END-OF-SEMESTER EXAMINATIONS : NOVEMBER – 2023

M.Sc. – PHYSICS   **MAXIMUM MARKS: 75**

SEMESTER - I   **TIME : 3 HOURS**

CLASSICAL MECHANICS

SECTION – A   **(10 X 1 = 10 MARKS)**

ANSWER THE FOLLOWING QUESTIONS.
(MULTIPLE CHOICE QUESTIONS)   **(k1)**

1. -------------is not a type of constraint.

   (a) Holonomic   (b) Non- Holonomic   (c) Rheonomic   (d) Cyclonomic

2. The Hamiltonian H = --------.

   (a) T + V   (b) T- V   (c) T/V   (d) T x V

3. The Hamilton's Characteristic function generates a canonical transformation in which all new

   co-ordinates are-------.

   (a) Cyclic   (b) non-cyclic   (c) random   (d) co-cyclic

4. In Lagrange's method, the Euler's angles are treated as ----------.

   .   (a) legal   (b) generalized coordinates   (c) constraints   (d) momenta

5. The Generalized coordinates, each one of them executing oscillations of one single frequency are

   called ------------coordinates.

   (a) normal   (b) ordinary   (c) stable   (d) free

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

6. What is known as Central Force?

7. Mention the use of Canonical Transformations.

8. Write the Hamilton- Jacobi equation for Hamilton's Principal Function.

9. Define: Rigid Body.

10. Distinguish between the Stable and Unstable Equilibriums.

ETHICAL PAPER

SECTION – B **(5 X 5 = 25 MARKS)**

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

11. (a) (i) What are Generalized Coordinates?

    (ii) Give the expressions for generalized coordinates for Velocity and Acceleration.

    (OR)

    (b) Deduce Lagrange's equation of motion from Hamilton's Principle.

12. (a) Obtain Hamilton's Canonical equations of motion.

    (OR)

    (b) Derive the equations of motion in Poisson Bracket Form.

13. (a) Deduce Hamilton-Jacobi Partial Differential equations.

    (OR)

    (b) Discuss about the Particle Falling Freely using Hamilton – Jacobi method.

14. (a) Deduce the Euler's equations for a Rigid Body.

    (OR)

    (b) Write a note on Force- Free motion of Symmetrical Rigid Body.

15. (a) Discuss about the Properties of T,V and ω.

    (OR)

    (b) Write a note on the oscillations of Two Coupled Oscillators.

SECTION – C **(5 X 8 = 40 MARKS)**

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

(K4 (Or) K5)

16. (a) State and explain the Hamilton's Variational Principle.

    (OR)

    (b) Obtain the equations for (i) Linear Harmonic Oscillator and (ii)Simple Pendulum.

17. (a) State and Prove the Principle of Least Action.

    (OR)

    (b) (i) What is known a s Generating Function?
        (ii) Discuss about the any two forms of it.

18. (a) Obtain the solution of Harmonic Oscillator problem by Hamilton- Jacobi method.

    (OR)

    (b) Explain in detail about the Action and Angle Variables.

19. (a) Define Euler's angles and derive the equations of motion in terms of Euler's angles.

    (OR)

    (b) Discuss the motion of a Symmetric Top under the action of Gravity.

20. (a) Derive the Lagrange's equations of motion for Small oscillations.

    (OR)

    b) What are the Free vibrations of Linear Triatomic Molecule. Derive the analytical

    expressions for normal frequencies and normal modes of vibrations.

ETHICAL PAPER ******