

(For candidates admitted from 2016–2017 onwards)

M.Sc. DEGREE EXAMINATION, APRIL 2023.

Mathematics

CLASSICAL DYNAMICS

Time : Three hours

Maximum : 75 marks

PART A — (10 × 2 = 20)

Answer ALL questions.

1. Define Angular momentum.
2. What is meant by kinetic energy of a system?
3. Write the application of Lagrange's equation in the standard form.
4. Define Natural systems.
5. Define Gyroscopic Forces.
6. Write the Rayleigh's Dissipation Functions.
7. State Hamilton's principle.

8. Write down the Legendre Transformation.
9. Write the solution of the Lagrang problem.
10. State Jacobi's Theorem.

PART B — (5 × 5 = 25)

Answer ALL questions, choosing either (a) or (b)..

11. (a) Explain potential Energy. <https://www.tnstudy.com>
Or
(b) A particle of mass m is suspended by massless wire of length $r = a + b \cos \omega t$ ($a > b > 0$) to form a spherical pendulum. Find the equation of motion.
12. (a) Derive Conservative system.
Or
(b) Find the differential equation of motion for a spherical pendulum of length l .
13. (a) Explain Electromagnetic force.
Or
(b) Find the equation of motion and the path of a particle of mass m and charge e moves under the influence of uniform electric and magnetic fields which are mutually orthogonal.

14. (a) Find the equation of motion. When a particle of mass m is attracted to a fixed point Q by an inverse square force $F_r = \frac{-\mu m}{r^2}$ by using the plane polar coordinates.

Or

- (b) Find the stationary value of the function $f = z$, subject to the constraints.

$$\phi_1 = x^2 + y^2 + z^2 - 4 = 0, \phi_2 = xy - 1 = 0$$

15. (a) Derive the Hamilton's canonical equations from the pfaffian form. <https://www.tnstudy.com>

Or

- (b) Derive the application of a simple mass spring system by using Hamiltonian Jacobi method.

PART C — (3 × 10 = 30)

Answer any THREE questions.

16. State and prove principal of virtual work.
17. Explain Liouville system.

18. Derive Lagrangian method.
19. Derive the Jacobi's form of a principle of least action.
20. State and prove Stackel's theorem.

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