

19. (a) Give a short note on symmetric and antisymmetric modes.

Or

- (b) Derive the solution of Eigen value equation.
20. (a) Derive the expression of proper time interval.

Or

- (b) Deduce the Lagrangian equation for relativistic particle.

PART C — ($3 \times 10 = 30$)

Answer any THREE questions.

21. Deduce the Hamilton's and modified principle from D'Alembert's principle.
22. Derive the Euler's angles.
23. Deduce the Hamilton equation from Jacobi's integral.
24. Derive the equation for small oscillation in normal co-ordinates.
25. Derive the equation for Mass–Energy conservation and give some examples.

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(For candidates admitted from 2022–2023 onwards)

M.Sc. DEGREE EXAMINATION, NOVEMBER 2023.

Physics

CLASSICAL MECHANICS

Time : Three hours

Maximum : 75 marks

PART A — (20 Marks)

Answer ALL questions.

- I. (A) Multiple choice questions : (5 × 1 = 5)

1. In variational principle the line integral of some function between two points is

- (a) zero (b) infinite
(c) extremum (d) one

2. The Euler–Lagrange differential equation is written as

- (a) $\frac{\partial f}{\partial y} - \frac{d}{dx} = 0$ (b) $\frac{\partial f}{\partial y} - \frac{d}{dx} \left(\frac{\partial f}{\partial y} \right) = 0$
(c) $\frac{\partial f}{\partial y} - \left(\frac{\partial f}{\partial y} \right) = 0$ (d) $\frac{d}{dx} \left(\frac{\partial f}{\partial y} \right) = 0$

3. If a Poisson bracket at a function with the Hamiltonian vanishes
 - (a) function depends upon time
 - (b) function is constant of motion
 - (c) function is not constant of motion
 - (d) none of these
4. The equation of motion for Spherical Pendulum is
 - (a) $\theta = -g/l (\cos \theta)$
 - (b) $\theta = -g/l (\sin \theta)$
 - (c) $\theta = g/l (\cos \theta)$
 - (d) $\theta = g/l (\sin \theta)$
5. In the case VLCC, Lorentz transformation is the same as
 - (a) Galilean transformation
 - (b) Einstein's transformation
 - (c) Maxwell's transformation
 - (d) Plank's transformation

(B) Fill in the blanks : (5 × 1 = 5)

6. The conditions which restrict the motion of the system are called _____.
7. Fore varies inversely as the square of the radial distance _____.
8. The equations $\frac{dH}{\partial q_i} = -p_i$ and $\frac{\partial H}{\partial p_i} = q_i$ are called _____ of motion.
9. The restoring force of the oscillating system will be _____.
10. A Frame of reference moving with a constant velocity relative to a fixed frame is called _____ frame.

- II. Answer the following questions: (5 × 2 = 10)
11. Define constraints.
12. Describe Euler angle.
13. Explain the conditions for Canonical transformation.
14. What is normal modes of vibration?
15. Explain Galilean invariance.

PART B — (5 × 5 = 25)

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

16. (a) Discuss about Generalized momentum and cyclic co-ordinates and derive the expression.
 Or
 (b) Give the short note on generalized co-ordinates.
17. (a) Define the Euler's equation of motion for a rigid body using Newtonian method.
 Or
 (b) Give the condition for motion of the particle under central force takes place in a plane.
18. (a) Derive the Hamilton's equation for charged particle moving in an electromagnetic field.
 Or
 (b) Deduce the expression for action and angle variable.