M.Sc. DEGREE EXAMINATION,APRIL 2020
II Year III Semester
Classical Mechanics

Time : 3 Hours **Max.marks :75**

Section A $(10 \times 2 = 20)$ Marks

Answer any **TEN** questions

1. Define the term degrees of freedom.
2. Give an example of holonomic constraints.
3. State Hamilton's principle for monogenic systems.
4. What is brachistochrone problem?
5. State Chasles' theorem.
6. Write a short note an Euler angles.
7. Define inertia tensor.
8. Describe Principal moments of inertia.
9. Write the Jacobi's form of the least action principle.
10. Discuss: Poisson brackets of function.
11. Define extended canonical transformation.
12. State general conservation theorem.

Section B $(5 \times 5 = 25)$ Marks

Answer any **FIVE** questions

13. Derive D'Alembert's principle.
14. Discuss the problem of finding the shortest distance between two points in a plane.
15. Define Coriolis force and explain its role with an example.
16. Obtain an expression for moment of inertia about the axis of rotation from inertia tensor.
17. Derive the principle of least action.
18. Explain the lagrangian formulation in the Atwood's machine.
19. Discuss Legendre transformation.

Section C $(3 \times 10 = 30)$ Marks

Answer any **THREE** questions

20. State and prove the conservation theorem for total angular momentum.
21. Derive Lagrange's equation from Hamilton's principle.
22. State and prove Euler's theorem on motion of a rigid body.
23. Consider a point mass *m* attached to a spring of force constant *k*, the other end of which is fixed on a massless. cart that is being moved uniformly by an external device with speed v_0. Find the lagrangian for this system.
24. Prove that the fundamental poisson brackets are invariant under canonical transformation.

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