M.Sc. DEGREE EXAMINATION,NOVEMBER 2018
II Year III Semester
Core Major -IX
CLASSICAL MECHANICS

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

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

Answer any **TEN** questions

1. State the conservation theorem for the angular momentum of a particle.
2. State the principle of virtual work.
3. State Hamilton's principle for monogenic systems.
4. What happens the linear momentum, if the system is invariant under translation along a given direction?
5. State Euler's theorem.
6. State Chasles' theorem.
7. A scalar is a tensor of ——————- rank.
8. Define principal axis transformation.
9. State Hertz's principle of least curvature.
10. What is meant by restricted canonical transformation?
11. What is meant by symplectic condition for a canonical transformations?
12. Define Poisson bracket of two functions u,v with respect to (q,p).

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

Answer any **FIVE** questions

13. State and prove conservation theorem for the linear momentum of a system of particles.
14. Find the shortest distance between two points in a plane.
15. Explain the Coriolis force in oceanographic and meteorological phenomena.
16. Explain the inertia tensor and express the kinetic energy in dyadic notation.
17. State the three important qualifications to obtain the principle of least action.
18. If $F = F_1(q, Q, t)$, show that $k = H + \dfrac{\partial F_1}{\partial t}$
19. Explain ROUTH's procedure about steady motion.

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

Answer any **THREE** questions

20. Derive the Lagrange's equations by using d'Alembert's principle.
21. Discuss the Brachistochrone problem and show that the cycloidal path leads to a stationary value of t.
22. Prove that the real orthogonal matrix specifying the physical motion of a rigid body with one point fixed always has the eigen value 1.
23. Obtain Hamilton's equations from Lagrange's equations using Legendre's transformation.
24. If u,v and w are three functions with continuous second derivatives, prove that $[u, [v,w]] + [v,[w,u]] + [w,[u,v]] = 0$

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