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Total No. of Pages : 02

Total No. of Questions : 20

M.Sc. (Physics) (2018 Onwards Batch) (Sem.–1)

CLASSICAL MECHANICS

Subject Code : MSPH-412-18

M.Code : 75123

Time : 3 Hrs.

Max. Marks : 70

INSTRUCTIONS TO CANDIDATES :

- 1. SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.
- 2. SECTION-B contains SEVEN questions carrying FIVE marks each and students have to attempt any SIX questions.
- 3. SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.

SECTION-A

- 1. Find the number of degrees of freedom for a rigid body moving freely in space.
- 2. What is nature of constraint for a pendulum with variable length?
- 3. What do you mean by ignorable coordinates?
- 4. Show that the transformation

 $P = \log(sinp) : Q = q \tan p$, is canonical

- 5. What is advantage of variational principle formulation?
- 6. Define principle of least action.
- 7. Write a note on Infinitesimal Canonical transformation.
- 8. What do you understand by inertia tensor?
- 9. Why Lagrangian mechanics is more superior to Newtonian mechanics?
- 10. What do you mean by the conservative and non-conservative force?

SECTION-B

11. What is D' Alembert principle? Derive Lagrange's equations of motion from it for

conservative system.

- 12. Obtain the equation of motion of a simple pendulum by using Lagrangian formulation and hence deduce formula for its time period for small amplitude of oscillations.
- 13. State Hamilton's principle and derive Lagrange's equations of motion from his principle.
- 14. Show that geodesics of a sphere are great circle.
- 15. Show that when the vector sum of the external forces acting upon a system of particles equals zero, the total linear momentum of the system remains conserved.
- 16. What are canonical transformations? Obtain canonical transformation equations for any two types of generating function.
- 17. Derive the expression for rotational kinetic energy of a rigid body.

SECTION-C

- 18. Show that the generalized momentum conjugate to cyclic coordinate is conserved. Hence deduce linear momentum conservation theorem from this generalized momentum conservation theorem.
- 19. Derive Hamilton's Canonical equations of motion. What is the physical significance of Hamiltonian function?
- 20. Discuss Euler angles as the generalized coordinates for a rigid body motion and obtain an expression for the angular velocity of a rigid body in terms of Euler' angles.

NOTE : Disclosure of Identity by writing Mobile No. or Marking of passing request on any paper of Answer Sheet will lead to UMC against the Student.