SUB.CODE: 18PMM4C12

REG.NO:

DHANALAKSHMI SRINIVASAN COLLEGE
OF ARTS & SCIENCE FOR WOMEN
(AUTONOMOUS)
(For Candidates admitted from 2019-2020 onwards)

PG DEGREE EXAMINATIONS APRIL – 2021
M.SC - MATHEMATICS
CLASSICAL DYNAMICS

Time: 3 Hrs **Max.Marks: 75**

PART –A

CHOOSE THE CORRECT ANSWER. **(10*1=10)**

1. The number of degrees of freedom is equal to
   a) no. of coordinates – no. of equations b) no. of equations – no. of coordinates
   c) no. of equations d) no. of coordinates
2. Any system of coordinates which are either fixed or having uniform velocity without rotation is called
   a) Cartesian system b) Mechanical system c)Inertial system d) Dynamical system
3. The generalized momentum corresponding to each cyclic coordinate is
   a) zero b) one c) constant d) none of these
4. A particle of unit mass is attracted by an inverse square gravitational force to a fixed point O. This is called
   a) Kepler's problem b) Lagrange's problem c) Jacobi problem d) Routhian function
5. The Lagrange's equation of motion for impulsive force is
   a) $\Delta\dot{q}=m^{-1}\hat{Q}$ b) $\Delta\dot{q}=m^{-1}Q_i$ c) $\Delta p=m^{-1}\hat{Q}$ d) $\Delta\dot{q}=\hat{Q}$
6. A constraint which is represented by a discontinuous constraint equation is Called
   a) Constraint impulse b) Impulsive constraint
   c) holonomic constraint d) non-holonomic constraint
7. A conservative holonomic system the Hamiltonian function H (q, p) has ……..
   a) a imaginary value b) a constant value
   c) non-constant value d) none of these
8. A conservative holonomic system the Hamiltonian function H (q, p) is equal to the ……..
   a) Lagrangian b) Total energy c) Kinetic energy d) Potential energy

9. $\dot{H} = -\frac{\partial L}{\partial t}$ is _____

a) Holonomic system b) non-holonomic system

c) Rhenomicsystem d) non-Hamilton function

10. Which of the following is Hamilton canonical equation

a) $\dot{q}_j = \frac{\partial H}{\partial p_j}$ b) $\dot{P}_j = -\frac{\partial H}{\partial q_j}$ c) either (a) or (b) d) both (a) & (b)

PART –B

ANSWER ALL THE QUESTIONS **(5*7=35)**

11. a) State and prove d' Alembert's principle

(OR)

b) State and Prove work and kinetic energy

12. a) Derive the Lagrangian Equation form of d'Alembert's principle.

(OR)

b) Describe the Routhian function

13. a) Explain Gyroscopic forces.

(OR)

b) Describe Electromagnetic forces

14. a) Obtain Hamilton's equation from Lagrange's equations via Legendre transformation.

(OR)

b) Describe the modified Hamilton's principle.

15. a) State and prove Jacobi's theorem

(OR)

b) Derive the canonical integral for Hamilton principal function.

PART – C

ANSWER ANY THREE QUESTIONS **(3*10=30)**

16. Show that the matrix form of rotational kinetic energy, $T_{rot} = \frac{1}{2}\omega^T I \omega$
17. Derive the Lagrange's equation of non-holonomic system.
18. Obtain the differential equations of motion using the Routhian procedure and show that the small motion near a reference condition of steady precession.
19. Prove that principle of least action.
20. Derive the Hamilton-Jacobi equation.