SEAT No._____ No. of Printed Pages : 2

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SARDAR PATEL UNIVERSITY

B.Sc. Semester – V [NC] Examination

Subject Code: US05CPHY01

Subject: Classical Mechanics

Date & Day: 24-12-2020, Thursday

Time: 02:00pm to 04:00 pm

Total Marks – 70

Q-1 Multiple Choice Question **[10]**

1. In a spherically symmetrical potential the angular momentum L=_____.
   (a) Angular velocity (b) Constant
   (c) Proportional to r (d) Proportional to r2
2. The distance between any two particles of a _____ is constant.
   (a) Rigid body (b) liquid
   (c) Flexible body (d) gaseous body
3. _____ Constraints are independent of time.
   (a) Holonomic (b) Non-Holonomic
   (c) Scleronomous (d) Rheonomous
4. The electrostatic force between two like charges are _____.
   (a) Zero (b) Infinity
   (c) Attractive (d) Repulsive
5. In a _____ system of N particle is denoted by single points.
   (a) Momentum space (b) Configuration space
   (c) Cartesian (d) three dimensional
6. Force of friction is _____ force.
   (a) Linear (b) always constant
   (c) Conservative (d) non-conservative
7. The Hamilton function is defined by _____.
   (a) H=T+V (b) H=F+V
   (c) H=T-V (d) H=F-V
8. The variation principle is also known as _____ principle.
   (a) Integral (b) linear
   (c) Differential (d) logarithmic
9. The potential due to dipole falls off as _____.
   (a) 1/r2 (b) r2
   (c) 1/r (d) r
10. Electric field of a dipole falls as a_____of a distance.
    (a) Square (b) Cube
    (c) Fourth (d) Fifth Power

Q-2 Do as Directed (Fill in the blanks and True or False) **[08]**

1. For a circular orbit the value of eccentricity _____. [$\epsilon = 0$, $\epsilon = 1$]
2. The number of independent variable for free particles in space is _____. [3N, 2N]

(P.T.O.)

3. Shape of an orbit of a planet around the sun is _____. [Circular, elliptical]

4. Orientation of a rotating body is specified by _____ angles. [Stable, unstable]

5. [True, False] Electric quadrupole consists of two pair of inverted dipole.

6. [True, False] The shortest distance between two points in a plane is a circle.

7. [True, False] In a branchistochrone problem the path of a particle is cycloid.

8. [True, False]. In absent of frictional frictional force the virtual work done by applied forces is zero.

Q-3 Answer the followings in short. (Any ten) **[20]**

1. What is central force?
2. Give the statement of Chasle's theorem.
3. Explain briefly weight less condition of an observer in a satellite.
4. Write down Hamilton's principle.
5. State the variational principle.
6. State Kepler's law.
7. Show the rate of dissipation of energy is twice the Rayleigh dissipation function.
8. Explain double pendulum
9. Explain spherical pendulum.
10. Write down moment of inertic tensor in a matrix notation.
11. Explain Pseudo forces with an example.
12. What are the requirements are of generalizes coordinates?

Q-4 Answer the following questions. (Any four) **[32]**

1. Discuss the motion of particle in an inverse square law force field.
2. Obtain polar equation for elliptical orbit. Hence obtain equation for eccentricity.
3. Discuss the D' Alembert's principle.
4. Explain spherical pendulum and obtain expression of its energy.
5. Discuss the torque free motion and obtain components of angular velocity.
6. Discuss the rotating coordinate system and derive necessary expressions.
7. Obtain Newton's equation of motion from Langrangian's equation
8. Derive the Euler's equation using δ- notation.

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