Vitthalbhai Patel & Rajratna P.T.P.SCIENCE COLLEGE

VALLABH VIDYANAGAR

B.Sc. (Semester - 5)

Subject: Physics

Course: US05CPHY01

Classical Mechanics

First Internal Test

Date: 30/09/2013 **Time – 3:30 p.m to 5:00 p.m**

Monday **Total Marks – 30**

Q-1 Multiple choice questions **06**

(1) At the turning point in an arbitrary potential field the radial velocity is _____

(a) 1 (b) 0.5

(c) 0 (d) 0.1

(2) For elliptical orbit the values of energy E and eccentricity ϵ are _____

(a) E=0 and ϵ =1 (b) E=0 and ϵ >1

(c) E< 0 and ϵ < 1 (d) E>0 and ϵ =0

(3) The Lagrange's equations of motion for a system is equivalent to _____ equations of motion

(a) Poisson (b) Newton's

(c) Laplace (d) Maxwell's

(4) The Hamiltonian function is define by _____

(a) $H = F + V$ (b) $H = T - V$

(c) $H = T + V$ (d) $H = F - V$

(5) The equation of constraints is _____ for a cylinder rolling on inclined plane

(a) $r\, d\emptyset - dx = 0$ (b) $r\, d\theta - dx = 0$

(c) $r\, dr - dx = 0$ (d) $r\, dx - dx = 0$

(6) The equation of constraints for a simple pendulum is _____

(a) $r\, d\theta - l = 0$ (b) $r + l = 0$

(c) $r\, d\theta + l = 0$ (d) $r - l = 0$

Q-2 Short Questions (Attempt any three) 06

(1) Define equipotential surface
(2) State the Gauss' law for the flux
(3) State the D'Alembert's principle in words.
(4) Define cyclic coordinates
(5) Show that the Lagrangian and Newtonian equation are equivalent
(6) What is undetermined multiplier?

Q-3 06

Derive the expressions of fields and potentials for dipole

OR

Q-3 06

Discuss the motion of a particle in a central force field and prove the conservation laws of linear momentum and total energy

Q-4 06

What are constraints? Explain, giving examples, the meaning of holonomic and nonholonomic constraints

OR

Q-4 06

Derive the general expression of kinetic energy and find the kinetic energy of double pendulum from it

Q-5 06

Construct the Lagrangian for motion of a particle on a sphere and derive the equations of motion using undetermined multiplier

OR

Q-5 06

Construct the Lagrangian for series connection of inductance L, resistance R and capacitor C with an external electromotive force $\varepsilon(t)$