

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

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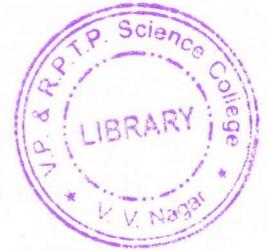
B.Sc. (Semester - 5)

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  $\epsilon$  are \_\_\_\_\_

- (a)  $E=0$  and  $\epsilon =1$  (b)  $E=0$  and  $\epsilon >1$   
(c)  $E < 0$  and  $\epsilon < 1$  (d)  $E > 0$  and  $\epsilon =0$

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

- (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)  $r d\theta - dx = 0$  (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  $\epsilon(t)$