



**LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034**

**M.Sc. DEGREE EXAMINATION – MATHEMATICS**

**THIRD SEMESTER – APRIL 2016**

**MT 3812 – CLASSICAL MECHANICS**

Date: 27-04-2016

Dept. No.

Max. : 100 Marks

Time: 09:00-12:00

Answer ALL Questions.

01. a. Briefly explain the different kinds of motion.

**OR**

b. Derive the equation of motion of Atwood's machine. (5)

c. Derive the Lagrangian equation of motion.

**OR**

d. Derive the solution of variational principle. (15)

02. a. Derive the Hamiltonian's canonical equations of motion.

**OR**

b. Find the Routh's function for the motion of a projectile. Hence deduce equation of motion. (5)

c. State Hamilton's principle and deduce Lagrange's equation from Hamilton's principle and hence find the equation of motion of one dimension Harmonic oscillator.

**OR**

d. Derive the Hamiltonian's principle of least action. (15)

03. a. Explain the types of periodicity.

**OR**

b. Show that  $Q = (2q)^{\frac{1}{2}}e^k \cos p$ ,  $P = (2q)^{\frac{1}{2}}e^k \sin p$  is a canonical transformation. (5)

c. State and prove Integral Invariant theorem of Poincare.

**OR**

d. Discuss about the motion of a top. (15)

04. a. Derive the relation between Lagrange and Poisson brackets.

**OR**

b. State and prove Liouville's theorem. (5)

c. State and prove Jacobi's Identity

**OR**

d. Derive the conservation theorem of angular momentum using Infinite decimal contact transformation. (15)

05. a. Derive the Hamilton principle function.

**OR**

b. Discuss the motion of a particle moving in a plane under the action of central force using Hamilton - Jacobi equation. (5)

c. Discuss about the Harmonic Oscillator problem.

**OR**

d. Discuss Kepler's problem using action angle variable. (15)

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