December - January 2014-15
M. Sc. Ist Semester Examination

PHYSICS

Paper II : Classical Mechanics

Time 3 Hours]

[Max. Marks · Regular 85 / Private 100 / Old ATKT 35

Note : The question paper is meant for all Regular, Private and Old ATKT students. Answer all five questions. All questions carry equal marks. The blind candidates will be given 60 minutes extra time.

1. Discuss the following :
   (a) Constraints and their classification.
   (b) De Alembert's principle in generalized coordinates.
   (c) The differential equation for the orbit.

   OR

   (a) Explain generalized momenta and Lagrangian formulation of the conservation theorem.
   (b) Discuss reduction of many body problem to the equivalent one body problem.

2. (a) Explain Hamilton-Jacobi action and angel variables.
   (b) What are generating functions. State and prove poisson theorem.

   OR

   (a) Discuss Poissons brackets and their algebric properties. Obtain the equation of motion in Poisson's Brackets notation.
   (b) What are inverse central force field ?

3. Describe the following :
   (a) Rotating coordinate systems.
   (b) Coriolis force and its terrostrial astronomical applications.

   OR

   (a) Discuss the elementary treatment of Eulerian coordinates and transformation matrices.
   (b) Obtain Eular equation of motion for a rigid body.

4. Describe the terms 4-vectors and 4-scalars, 4-momentum and 4-force. Explain covariant Lagrangian.

   OR

   Explain symmetries of space and time. Discuss (i) invariance under gallilion transformation and (ii) covariant Hamiltonian.

5. Discuss any two of the following :
   (a) The equation of motion and first integral.
   (b) Rutterford Scattering.
   (c) Rotating Coordinate System.
   (d) Covariant four dimensional formulation.