

**FACULTY OF SCIENCE****M.Sc. I – Semester (CBCS) Examination, December 2016****Subject: Physics & Applied Electronics****Paper – II  
Classical Mechanics****Time: 3 Hours****Max.Marks: 80****Note: Answer all questions from Part – A and Part – B.****Each question carries 4 marks in Part-A and 12 marks in Part-B.****PART – A (8x4 = 32 Marks)  
[Short Answer Type]**

- 1 Explain the Torque-free motion of a rigid body.
- 2 Find out the rotational kinetic energy of a rigid body.
- 3 Explain virtual displacement and virtual work.
- 4 Obtain equation of motion for a simple pendulum using Lagrange's equation.
- 5 Define Hamiltonian function.
- 6 What are cyclic coordinates? Mention their advantages.
- 7 What do you understand by stable and unstable equilibria?
- 8 Derive Hamiltonian formulation of relativistic mechanics.

**PART – B (4x12 = 48 Marks)  
[Essay Answer Type]**

- 9 a) Obtain the Euler's equations of motion for a rigid body.  
**OR**  
b) State clearly the Lorentz transformation equations. Obtain Lorentz transformations in Minkowski space.
- 10 a) Explain velocity dependent potentials and dissipation function. Obtain Lagrangian for a charged particle in an EM field.  
**OR**  
b) State Hamilton's principle and derive Lagrange's equations from Hamilton's principle.
- 11 a) Define Canonical transformation and get transformation equations for the four generating functions.  
**OR**  
b) Derive an expression for the Hamilton's equation of motion.
- 12 a) Discuss the eigen value equation for small oscillations. How will you obtain the eigen values from this equation.  
**OR**  
b) Define normal coordinates and normal modes and obtain eigen vectors for a linear triatomic molecule.

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