Unit III

5. (a) Discuss stable and unstable equilibrium. Setup the Lagrangian function for a free vibration with one degree of freedom and hence obtained the equation of motion. **10**

(b) State and prove Principle of Least action. **10**

6. (a) Derive the Euler's equation of motion of a rigid body and modify these equation for free motion. **8**

(b) Explain Legendre transformation and obtain Hamiltonian Equations. **6**

(c) Discuss Torque free motion of rigid body having symmetrical top. **6**

Unit IV

7. (a) What is the condition for a transformations to be canonical, discuss the its advantages and obtained the equations for the transformation between the variables (q, p) and (Q, P) with $F_1(p, P, t)$ and $F_2(p, Q, t)$. **14**

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AA282

M.Sc. EXAMINATION, May 2019

(First Semester)

(B. Scheme) (Re-appear)

PHYSICS

PHY503B

Classical Mechanics

Time : 3 *Hours*] [*Maximum Marks :* 100

Before answering the question-paper candidates should ensure that they have been supplied to correct and complete question-paper. No complaint, in this regard, will be entertained after the examination.

Note : Attempt *Five* questions in all, selecting at least *one* question from each Unit.

Unit I

1. (a) Define closed system, state and explain energy theorem for '*n*' particle system. **8**

(b) Define dissipative function and obtained the Lagrangian equation for dissipative system. **6**

(c) What are Constraints ? Explain the forces of constraints wih a specific example. How is it related with degree of freedom ? **6**

2. (a) Derive Lagrangian Equation using variational principle, extends it for Non-Holonomics system. **10**

(b) Obtained the Lagrangian for a disc of mass '*m*' and radius '*r*' rolling down an inclined plane without slipping;' find its equation of motion and force of constraints. **10**

Unit II

3. (a) Define Euler's angles and obtain an expression for the complete transformation. Express angular velocity of a rotating body in term of Euler's angles. **12**

(b) Define inertia tensor and obtained its expression for a rigid body. **8**

4. (a) Derive an expression for equation of motion under central forces and prove Kepler's third law. **8**

(b) Derive the equation of conic for orbits associated with a rotating body and classify their types. **8**

(c) Derive the expression for Coriolis acceleration discuss Coriolis force. **4**

(b) Show that the transformation $P = 1/2(p^2 - q^2)$ and $Q = \tan^{-1}(q/p)$ are canonical. **6**

8. (a) Discuss invariance of Poisson's Bracket under canonical transformation and show that $[z, L_z] = 0$ and $[z, L_y] = x$. **8**

(b) Write a note on Jacobi identify. **4**

(c) Define Hamilton Jocobi Principle and drive and equation of motion of harmonic oscillator. **8**

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