Dy Rayed Kamo Ky

National Institute of Technology Hamirpur (H.P.) Department of Physics and Photonics Sciences End Term Examination (B.Tech. 4th Semester) *Classical Mechanics – PH-222*

T.T.: 3 hrs

Note: All questions are compulsory.

- 1. Write the Rutherford's scattering cross section formula and write the meaning of each term. 2
- 2. Define configuration space and phase space. 3
- 3. What are cyclic coordinates and what is their importance in Hamilton's mechanics? 3
- 4. Define: Point transformation, Legendre transformation and canonical transformation. 4
- 5. Discuss the underlying reason for the conservation of linear momentum and angular momentum. 4
- 6. What are Poisson brackets? Show how these can be used to express the time derivative of a function of canonical variables and time. 5
- 7. Show that is we consider canonical transformation of type 1 as $F_1(q,Q,t) = q_j Q_j$, the canonical variables get swapped. 5
- 8. Obtain the Euler Lagrange equation for two particles interacting through central force field. 6
- 9. Discuss Hamilton's principle in phase space and show that the resulting dynamical equations are Hamilton's equation. 6
- 10. Discuss how using generalized coordinates, we can study small oscillations of a scleronomic and holonomic system with n degrees of freedom, sitting in stable equilibrium. 6
- 11. Draw a diagram to show the scattering of an incident beam of particles by a center of force and define: Differential cross section, scattering angle, impact parameter, angular momentum. 6

M.M.: 50