7. The potential energy function bet^n two atoms of a diatomic molecule is given by

$$V = \frac{a}{x^{12}} - \frac{b}{x^6} \qquad \text{where } a, b \text{ are +ve constants.}$$

x is separation bet^n atoms

find the equilibrium point and check its stability.

8. A particle of mass 'm' moves along the x-axis under the influence of PE $\qquad V(x) = -k \, x \, e^{-\beta x}$
find the equilibrium position and its stability.

9. A mass m, moves in a circular orbit of radius r_0 under the influence of a central force whose potential is $-k/r^n$. Show that the circular orbit is stable under small oscillations.

10. Define Poisson bracket of two dynamical variables. Show that for any three dynamical variables u, v, w the Jacobi identity

$$[u, [v, w]] + [v, [w, u]] + [w [u, v]] = 0$$

11. Prove that Poisson's bracket donot obey commutative law of algebra but obeys distributive law of algebra.

12. Prove that $[X, YZ] = Y[X, Z] + [X, Y]Z$ for Poisson's brackets.

13. Using Poisson's brackets, show that total time derivative for a function $f(q, p, t)$ is given as,

$$\frac{df}{dt} = \frac{\partial f}{\partial t} + [f, H] \qquad H = \text{Hamiltonian}$$