

Tut-7

Hamiltonian &
momentum conjugate

Find out the ~~the~~ momentum conjugate
& Hamiltonian (H) for the below
Lagrangian (L) ?

$$(i) \quad L = \frac{1}{2} m \dot{x}^2 - \frac{1}{2} k x^2 - \alpha x^3 + \beta x \dot{x}$$

($k, \alpha, \beta, m \rightarrow \text{constant}$)

$$(ii) \quad L = \frac{1}{2} m_1 \dot{x}_1^2 + \frac{1}{2} m_2 \dot{x}_2^2 - \frac{1}{2} k_1 (x_1 - x_2)^2 - \frac{1}{2} k_2 x_1^2$$

($m_1, m_2, k_1, k_2 \rightarrow \text{constant}$)

$$(iii) \quad L = \frac{1}{2} m (\dot{r}_1^2 + r_1^2 \dot{\theta}^2 + r_1^2 \sin^2 \theta \dot{\phi}^2) + \frac{1}{2} m \dot{r}_2^2$$
$$- k (r_1 - r_2) \sin \theta$$

[$m, k \rightarrow \text{constant}$]

$$(iv) \quad L = \dot{q}_1^2 + \dot{q}_1 \dot{q}_2 + \frac{\dot{q}_2^2}{2} - \frac{k}{(q_1 - q_2)}$$

($k \rightarrow \text{constant}$)