

# SHRI KRISHNA MAHAVIDYALAYA, GUNTUR.

Department of Mathematics  
M.Sc. Maths Sem-IV (2021-2022)

## Project

Student Name :- Miss. Dongare Tejaswini Anand

Std :- M.Sc. II<sup>nd</sup> (Maths)

Subject :- Mechanics

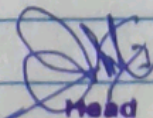
Paper No :- MAT 512

Project Name :- Lagrange's equation  
from Hamilton's principle.

PRN NO :- 2020015200784734

Seat NO :-

15  
20

  
Head

Department of Mathematics,  
Shri Krishna Mahavidyalaya, Guntur  
Tq. Omega Dist. Guntur  
(M.S.)-413606

  
BRILLIANT



# Index

Sr. NO.	Titles
1	Introduction
2	Basic Definitions
3	Lagrange's equation
4	Hamilton's principle
5	Lagrange equations from Hamilton's principle.
6	Note of Thanks
7	Reference.



# Introduction.

First of all let me introduce my self My name is Tejaswini Anand Dong and the institution name where I am currently study in the name is Shri Krishna Mahavidyalaya, Ganjati

I study in M.Sc. II (maths) this report is about the subject wise project work. Subject name is my allated topic Name was

"Lagrange's equation from Hamilton's principle."

I completed my project work as shown in this report



\* Basic Definitions:-

\* Mechanics:-

Mechanics is the study of mathematics and physics with the relationships between matter and motion among objects forces applied to objects result in displacements and changes of an object's position relative to its environment.

\* There are two main types of mechanics

i) Classical mechanics

ii) Quantum mechanics.



\* Lagrange's equation: -

$$q \dot{t} = 0, \quad d \dot{t} L(q, \dot{q}, t) = 0$$

The becomes a differential equation (2nd order in time) to be solved

It is the equation of motion for the particle and is called Lagrange's equation.

How do you derive Lagrangian from Hamiltonian.

Given the Lagrangian  $L$  for a system we can get the Hamiltonian  $H$  using the definition

$$H = \sum p_i \dot{q}_i - L \quad \text{where}$$

$$p_i = \frac{\partial L}{\partial \dot{q}_i}$$



## \* Hamilton's principle

Hamilton's principle states that the true evolution  $q(t)$  of a system described by  $N$  generalized coordinates

$$q = (q_1, q_2, \dots, q_N)$$

between two specified states

$$q_1 = q(t_1) \quad \text{and}$$

$$q_2 = q(t_2) \quad \text{at two}$$

specified times  $t_1$  and  $t_2$  is a stationary point (a point where the variation is zero) of the action functional.



\* Lagrange equations from Hamilton's principle."

Hamilton published two papers in 1834 and 1835, announcing a fundamental new dynamical and Hamiltonian mechanics. Hamilton was seeking a theory of optics when he developed Hamilton's Action principle plus the field of which play a crucial role in classical mechanics and modern physics. Hamilton's Action principle states "dynamical systems follow paths that minimize the time integral of the Lagrangian."

That is the action function

$$S = \int_{t_1}^{t_2} L(q, \dot{q}, t) dt$$

$$\delta S = \delta \int_{t_1}^{t_2} L dt = 0$$



$$\frac{d}{dt} \frac{\partial L}{\partial \dot{q}_j} - \frac{\partial L}{\partial q_j} = 0$$



## Reference.

1) google

2) wikipedia

3) Mechanics Notes

4) Mechanics

- by

Herbert Goldstein  
Charles P Poole  
John Safko.