Classical Mecanics

This chepter is given by me as demanded by you

certain defination :-

① Kinetic energy of the body is given by

$$T = \frac{1}{2} m v^2$$

② Potential energy of the body is given by the force to displace the body against any internal force.

Gravitational potential energy.

$$V = mgh.$$

Elastic Potental energy

$$V = \frac{1}{2} K x^2$$

where $K = \frac{F}{x}$ = spring constant

③ Pressure energy E_p = Pressure × change in Volume.

$$E_p = P.dV.$$

④ Lagrangian function :- The differance of K.E and Potential energy is K/a Lagrangian function "L"

$$L = T - V$$

⑤ Hamiton function :- The sum of K.E and PE is K/a Hamilton function $H = T + V$

classical Mechanics is divided in to three Groups

(1) Newtonian Mechanics
(2) Lagrangian Mechanics
(3) Hamiltonian Mechanics

Newtonian motion deal the force, displacement acceleration, work, Power, energy of body or system. Lagrangian Mechanics deals the motion of the body with the difference of K.E & P.E

$$L = T - V$$

Hamiltonian Mechanics deals the motion of the particle or system in terms of sum of K.E & P.E

$$\boxed{H = T + V}$$

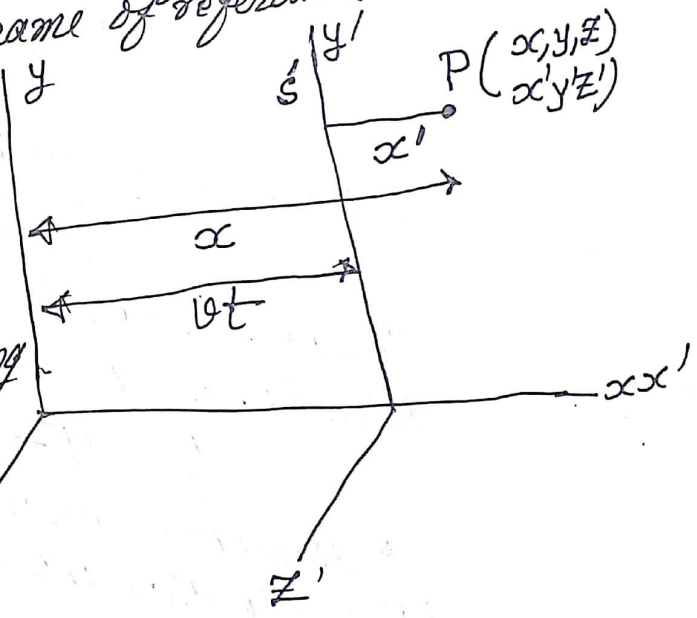
Newtonian Mechanics

Frame of reference :- The co-ordinate axis attached to the body and observer is K/a frame of reference.

Inertial frame of reference :- The frame of reference which obey the Law of inertia is K/a inertial frame of reference.

Hence, body is in uniform motion or at rest has inertial frame of reference.

Let us consider the inertial frame of reference S and S' in which S is is at rest and S' is moving with uniform velocity v along x-axis.



The transformation is given by (Co-ordinate)

$$x = x' + vt$$

Differentiating it,

$$\frac{dx}{dt} = \frac{dx'}{dt} + v\frac{dt}{dt}$$

$$\boxed{u = u' + v} \quad \text{---} \quad (A)$$

Where u and u' are the velocity of Particle P. in S and S' frame respectively.

Differentiating equn (A) again

$$\frac{du}{dt} = \frac{du'}{dt} + 0 \Rightarrow "a = a'"$$

If m = mass of the Particle P. then.

$$ma = ma'$$

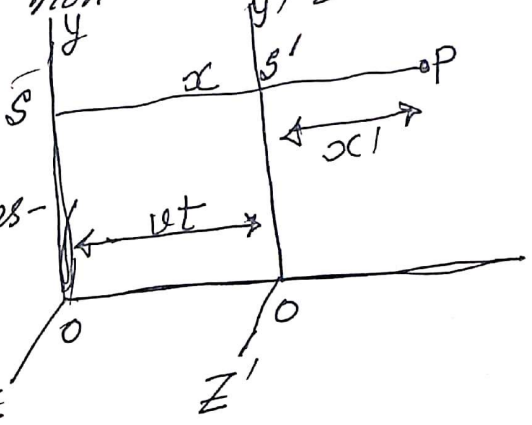
or, $\boxed{F = F'}$

Hence, the force acting upon the particle in both. frame are same, Hence, the law of Physics. are same in inertial frame.

Non-inertial frame of reference or accelerated frame of Referance:-

The frame of reference attached to the accelerated body is k/a non-inertial frame. of reference.

Let the body moving with uniform velocity v for the time t. The transformation co-ordinate is given by $\boxed{x = x' + vt}$



Differentiating it we get

$$\frac{dx}{dt} = \frac{dx'}{dt} + v \quad \text{or,} \quad u = u' + v.$$

If the body accelerated after the time t then.

$$\frac{du}{dt} = \frac{du'}{dt} + \frac{dv}{dt}$$

$$\text{or,} \quad a = a' + a''$$

Where a and a' are the acceleration of the body. with respect to s and s'. The force acting upon the particle is given by.

$$ma = ma' + ma''$$

$$F = F' + F''$$

Hence, in the accelerated frame a Vertual force F'' is developed k/a Pseudoforce.