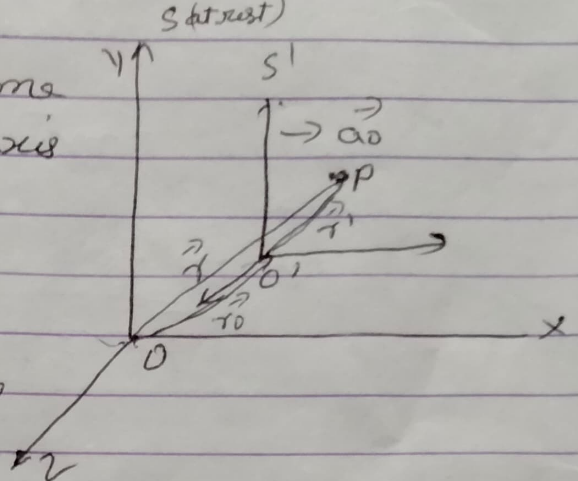
B.Sc – I 28/1/22

(1) (a) Expression for fictitious force due to translational accⁿ non inertial frame

Let S' is a non inertial frame having accⁿ $\vec{a_0}$ along x-axis w.r.t frame S and S is a stationary frame



From Δ law of vector addition

$$\vec{r} = \vec{r_0} + \vec{r}' \quad \text{——} (1)$$

Here $\vec{r}$, $\vec{r}'$ are position vector of point P w.r.t S and S' frame respectively and $\vec{r_0}$ is position vector of origin O' of S' frame.

$$\boxed{\vec{r}' = \vec{r} - \vec{r_0}} \quad \text{——} (2)$$

If point P is moving in the space, and we need to its velocity differentiating eqⁿ (2) w.r.t T.

$$\frac{d\vec{r}'}{dt} = \frac{d\vec{r}}{dt} - \frac{d\vec{r_0}}{dt}$$

$$\vec{v}' = \vec{v} - \vec{v_0}$$

To find accⁿ of particle w.r.t S', Diff. again

$$\frac{dv'}{dt} = \frac{d\vec{v}}{dt} - \frac{d\vec{v_0}'}{dt}$$

$$\boxed{\vec{a}' = \vec{a} - \vec{a_0}}$$

Multiply both ~~sy~~ side by the mass of particle

$$m\vec{a}' = \cancel{m}\vec{a} - m\bar{a_0}$$

$$\bar{F}' = \bar{F} - \vec{F_0}$$

Here $\vec{F_0}$ is due ~~to~~ $\bar{a_0}$

$\therefore$ F_0 is called fictitious force

Here $\vec{F_0} = m\bar{a_0}$ is due to the accⁿ of non inertial frame

If $\vec{a_0} = 0$, $\vec{F_0} = 0$

$$\boxed{\vec{F}' = \vec{F}}$$ For inertial frame.

$\vec{F}'$ = Force on the particle as seen frame S'

$\vec{F}$ = Force particle w.r.t frame S

$\vec{F_0}$ = Fictitious force due to accⁿ of force

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