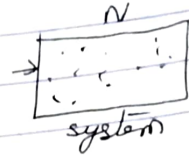


Principle of virtual work

consider a system of particles in equilibrium. The net force on the every particle must be zero.



$$\boxed{F_i = 0}$$

virtual displacement \Rightarrow

It is an assumed infinitesimal change of system co-ordinates occurring while time is held constant. (δx_i)

work done by a force



$$W = F \cdot \Delta S \cos \theta$$

$$W = F \cdot \Delta S = 0$$

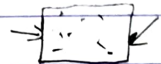
$$\boxed{W = F \cdot \Delta S}$$

$$\left. \begin{array}{l} \cos 90^\circ = 0 \\ \cos 0^\circ = 1 \end{array} \right\}$$

virtual work \Rightarrow

If a system is in equilibrium under the action of a number of forces then the total work done by the forces for a virtual displacement is zero.

$$\delta W = 0$$



For i^{th} particle

$$\delta W = F_i \delta x_i = 0$$

For all the particles

$$\sum F_i^a \delta x_i + \sum F_i^c \delta x_i = 0$$

Now, Assume that force due to constraint is zero

$$\sum F_i^a \delta x_i = 0$$

$$[\delta W = 0]$$

Thus virtual work is the work which is done on the system only by the applied forces. This is known as principle of virtual work.

