QUES 03:-

Show that a force that does no work must be a velocity dependent force.

Sol. The work done by a force is given by dW = F.dl = Fdl cos θ

As work done by force is zero, so

dW = F.dl = 0

$\Rightarrow F \cdot \frac{dl}{dt} \times dt = 0$

dW = F.v dt = 0

as dt $\neq$ 0 [$\therefore$ F.v = 0]

So F must be velocity dependent, i.e., angle between F and v must be 90° always, then for F.v = 0

Fv cos θ = cos 90°

θ = 90°

If v changes direction then to make θ = 90°, F must change angle according to v. So F is dependent of v to make work done zero.