Q At what speed should a clock be moved so that it may appear to lose 1 minute in each hour?

Sol. Given to find velocity v of clock

Dilated time $t = 1hr = 60 min$

& Proper time $t_0 = 1hr - 1 min$

$= 59 min$

From time dilation

$$t = \frac{t_0}{\sqrt{1 - v^2/c^2}}$$

$$60 = \frac{59}{\sqrt{1 - \frac{v^2}{c^2}}}$$

or $$1 - \frac{v^2}{c^2} = \left(\frac{59}{60}\right)^2$$

$$\frac{v^2}{c^2} = 1 - \left(\frac{59}{60}\right)^2$$

$$v = c\sqrt{1 - \left(\frac{59}{60}\right)^2}$$

$$v = 5.45 \times 10^7 \, m/s$$