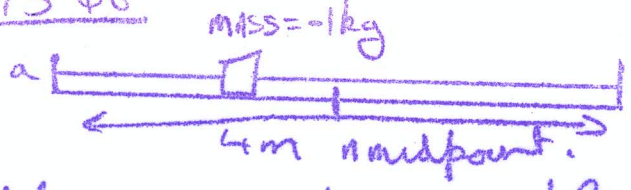
1975 Q6

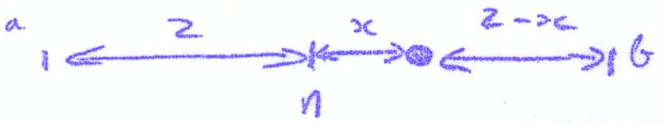


Each string $l_0 = 1$, $k = 5$

Equilibrium: position must be at n as the strings are identical.

Typical position: Consider forces at a point x metres from n.

Position:



Forces:

$L = k(\text{Ext}) = 5(2+x-1) = 5(1+x)$

$L = 5+5x.$

$R = k(\text{Ext}) = 5(2-x-1) = 5(1-x)$

$R = 5-5x.$

NII $\Rightarrow$ Net force = mass(accel)

$\Rightarrow -L+R = .1\,\text{accell}$

$\Rightarrow -(5+5x)+(5-5x) = .1(a)$

$\Rightarrow -10x = .1a.$

$\Rightarrow -100x = a$ which is SHM about the point n with $\omega = 10$.

A> the particle is released 1.5 metres from B, from rest. then amplitude A = distance from equil when released from rest.

$A = 2 - 1.5$

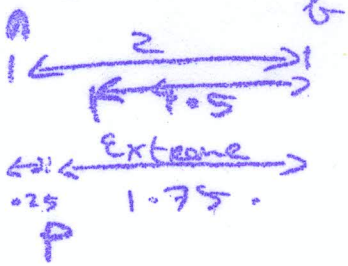
$\boxed{A = .5.}$

$\text{Period} = \frac{2\pi}{\omega} = \frac{2\pi}{10} = \frac{\pi}{5}$ seconds.

Time to travel from extreme position (where it starts) to point P, 1.75 m from b.

$\boxed{\text{At point P } x = .25}$ KEY

a:



As starts at extreme use $x = A\cos\omega t.$

$\therefore$ Time to reach P given by

$.25 = .5\cos 10t.$

$\Rightarrow .5 = \cos 10t.$

$\Rightarrow \frac{\pi}{3} = 10t.$

$\Rightarrow \boxed{\frac{\pi}{30}\text{ secs} = t}$