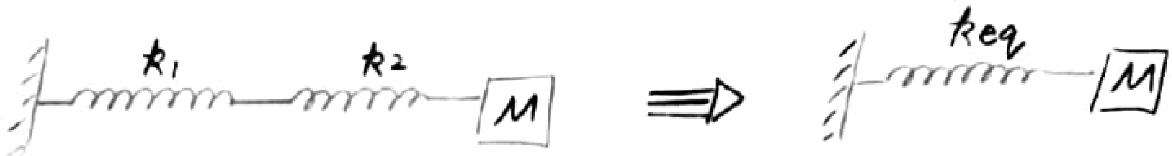
- **TIPS & TRICKS**

1> Combination of Springs

- **Series Combination**



- Force on both spring is same
- Extension in spring is different

$$\frac{x_1}{x_2} = \frac{k_2}{k_1} \quad \{\text{as } kx = \text{Same}\}$$

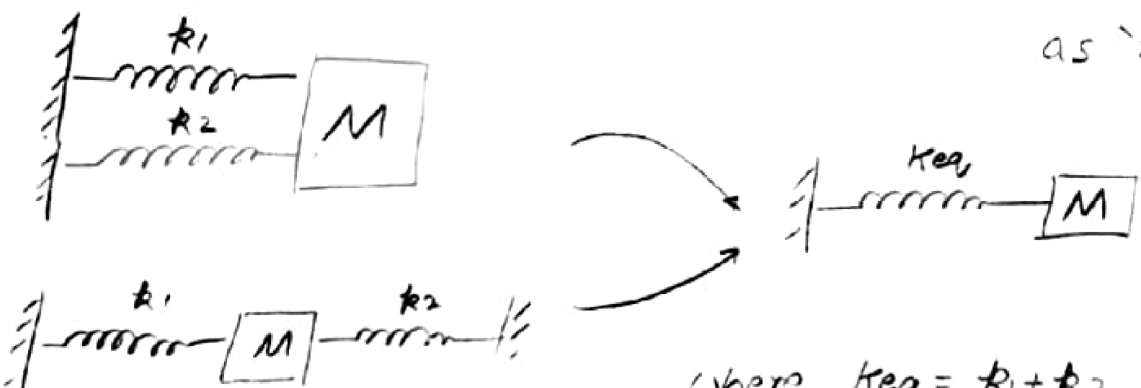
where $k_{eq} = \frac{k_1 k_2}{k_1 + k_2}$ or $\frac{1}{k_{eq}} = \frac{1}{k_1} + \frac{1}{k_2}$

so, $T = 2\pi\sqrt{\frac{M}{k_{eq}}}$

- **Parallel combination**
  - force on both spring different
  - Extension in spring is same.

$$\frac{F_1}{F_2} = \frac{k_1}{k_2} = \frac{PE_1}{PE_2}$$

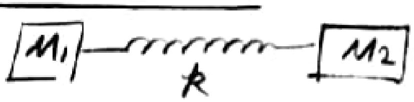
as 'x' is same



where $k_{eq} = k_1 + k_2$

so, $T = 2\pi\sqrt{\frac{M}{k_{eq}}}$

- **When two masses**



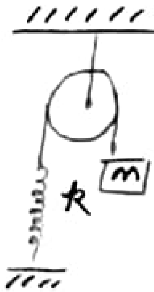
use $M = \frac{M_1 M_2}{M_1 + M_2}$ {REDUCED MASS}

so, $T = 2\pi\sqrt{\frac{M}{k}}$

SOME SPRING MASS SYSTEM :

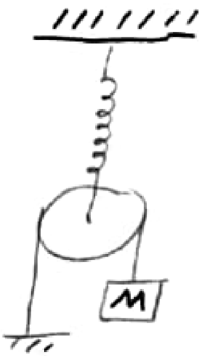
{FOR SOLVING THESE USE 2-STEP ANALYSIS MENTIONED IN TIPS & TRICKS PART OF LECTURE-1}

I>



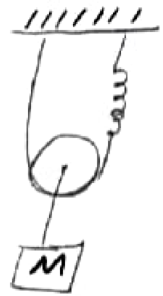
$$T = 2\pi\sqrt{\frac{m}{k}}$$

II>



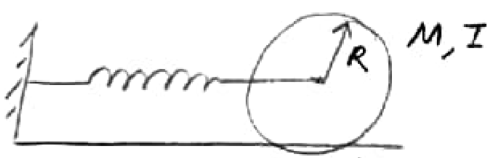
$$T = 2\pi\sqrt{\frac{4M}{k}}$$

III>



$$T = 2\pi\sqrt{\frac{m}{4k}}$$

IV>



No slipping

$$T = 2\pi\sqrt{\frac{M + I/R^2}{k}}$$

$I \equiv$ Moment of Inertia