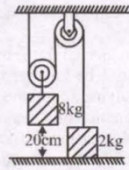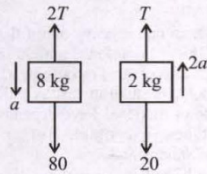QUES 02

The boxes of masses 2 kg and 8 kg are connected by a massless string passing over smooth pulleys. Calculate the time taken by box of mass 8 kg to strike the ground starting from rest. (use $g = 10 \text{ m/s}^2$)   [Aug. 27, 2021 (II)]

(a) 0.34 s

(b) 0.2 s

(c) 0.25 s

(d) 0.4 s

(d) From free body diagram

$80 - 2T = 8a$ ...(i)
$T - 20 = 4a$ ...(ii)

Multiply equation (ii) by 2 and adding with equation (i) we get

$(8 + 8) a = 40$

$\Rightarrow \quad a = \dfrac{40}{16} = \dfrac{10}{4} m/s^2$

Using $S = \dfrac{1}{2} at^2 \Rightarrow t^2 = \dfrac{2S}{a}$

$\Rightarrow \dfrac{0.2 \times 2 \times 4}{10} = t^2$

$\Rightarrow \quad t = 0.4 \text{ sec}$