GATE ME 30

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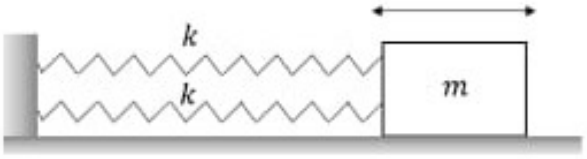
Question GATE ME 30 :

The figure shows a block of mass m = 20 kg attached to a pair of identical linear springs, each having a spring constant k = 1000 N/m. The block oscillates on a frictionless horizontal surface. Assuming free vibrations, the time taken by the block to complete ten oscillations is ____ seconds . (Rounded off to two decimal places) Take $\pi = 3.14$.



Solution: using table Table 0 ,

Parameter	Description	Value
k	spring constant	1000 N/m
m	mass of block	20Kg
k_{eq}	Equivalent spring constant	$k_1 + k_2$ (parallel)
ω_n	Natural frequency	$\sqrt{\frac{k_{eq}}{m}}$
T	Time period of an oscillation	$\frac{2\pi}{\omega_n}$

TABLE 0
PARAMETER TABLE

$$k_{eq} = 2000 \tag{1}$$
$$\omega_n = 10 rad/s \tag{2}$$

The time required to complete 10 oscillations using (1) and (2) is

$$10T = 10\frac{2\pi}{\omega_n} \tag{3}$$
$$= 2\pi \tag{4}$$
$$= 6.28 \tag{5}$$