

QUES 03

A mass of 10 kg is suspended by a rope of length 4 m, from the ceiling. A force F is applied horizontally at the midpoint of the rope such that the top half of the rope makes an angle of 45° with the vertical. Then F equals:
(Take $g = 10 \text{ ms}^{-2}$ and the rope to be massless)

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- (a) 100 N (b) 90 N
(c) 70 N (d) 75 N

(a) From the free body diagram

$$T \cos 45^\circ = 100 \text{ N} \quad \dots(i)$$

$$T \sin 45^\circ = F \quad \dots(ii)$$

On dividing (i) by (ii) we get

$$\frac{T \cos 45^\circ}{T \sin 45^\circ} = \frac{100}{F} \Rightarrow F = 100 \text{ N}$$

