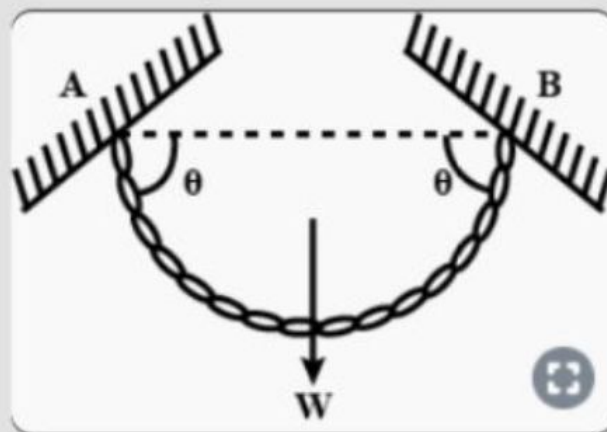


A flexible chain of weight W hangs between two fixed points A & B which are the same horizontal level. The inclination of the chain with the horizontal at both the points of support is θ . What is the tension of the chain at the mid point ?



A $\frac{W}{2} \operatorname{cosec} \theta$

B $\frac{W}{2} \tan \theta$

C $\frac{W}{2} \cot \theta$

D none

Correct option is A)

The weight of the chain is a downward acting force at the centre of mass of the chain which lies at the mid point.

The tension in the chain is the same throughout the chain and is a force that equals the net force acting on the chain.

If the tension is F , this can be divided into components in the horizontal direction and the vertical direction.

The force in the horizontal direction is $F \cdot \cos \theta$ this component cancels out.

The vertical component is equal to $2 \cdot F \cdot \sin \theta$ and this is equal to the weight of the chain W .

$$2 \cdot F \cdot \sin \theta = W$$

$$\Rightarrow F = \frac{W}{2 \cdot \sin \theta}$$

$$\Rightarrow F = \left(\frac{W}{2}\right) \cdot \operatorname{cosec} \theta$$

Hence,

option (A) is correct answer.