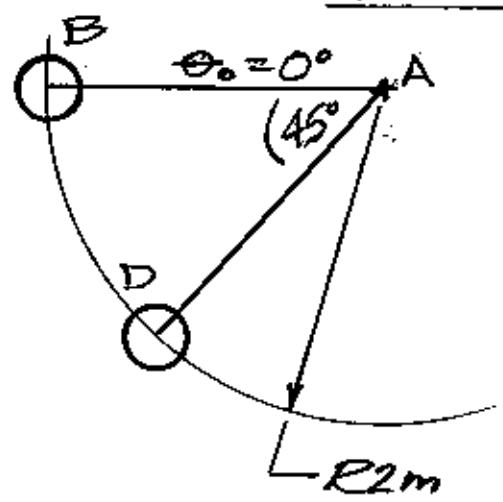
HIBBELER — PENDULUM

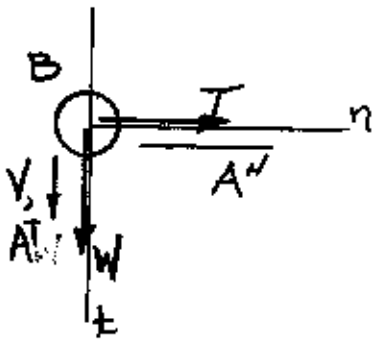


$m_{bob} = 5\,kg$

$W = 49.05\,N.$

I.C. AT REST @ B

$V_0 = 0$

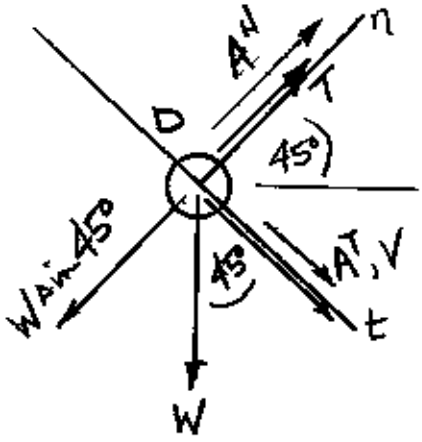


$$\Sigma \vec{F}_n = m\vec{a}^N$$

$$T = (5kg)\frac{V^2}{r} = 0 \quad \text{since } V_0 = 0 \;\checkmark$$

$$\Sigma \vec{F}_t = m\vec{a}^T$$

$$W = \frac{W}{g}a^T \quad \therefore a^T = g = 9.81\,\tfrac{m}{s^2}$$



$$\Sigma \vec{F}_n = m\vec{a}^N$$

$$T - W\sin 45° = \frac{W}{g}\frac{V^2}{r}$$

$$T = 49.05\sin 45° + (5kg)\frac{V^2}{2m.} \quad (1)$$

$$\Sigma \vec{F}_t = m\vec{a}^T$$

$$W\cos 45° = (5kg)\,a^T$$

$$a^T = \frac{mg\cos 45°}{m} = g\cos\theta \quad (2)$$

$a^T = 6.93\,m/s^2$ @ D

$V dV = a^T ds$

$\lfloor\ x = r\theta$

$\therefore ds = r\,d\theta$

$$\int_0^V V\,dV = \int_0^{45°} (9.81\cos\theta)(2m)\,d\theta$$

$$\frac{V^2}{2} = 19.62\int_0^{45} \cos\theta\,d\theta$$

$$V^2 = 39.24\sin\theta\Big]_0^{45} \Rightarrow \boxed{V = 5.268\,\tfrac{m}{s}}$$

(1) BACK SUB.

$\therefore \boxed{T = 104.05\,N}$

$+\ a^N = \frac{V^2}{r} = 13.875\,\tfrac{m}{s^2}$