07 May 2011
22:27

M1 JAN02 (1)

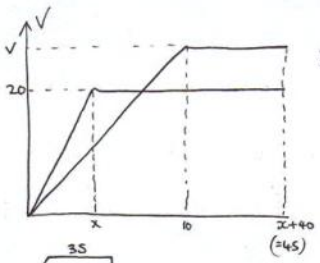
1) (0.3)↓8 (0.3)↑6 (=-6)
Mom before = 0.3×8 = 2.4Ns
Mom after = 0.3×-6 = -1.8Ns
Impulse = 4.2Ns

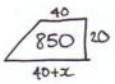
2) 1800 (4) 1200 (0) → 3000 (v)
Total mom before = 1800×4 = 7200Ns
Total mom after = 3000v
7200 = 3000v ⇒ v = 2.4ms⁻¹

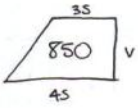
b) Momentum before R = 7200Ns ⇒ Impulse = 7200
Momentum after R = 0
Impulse = force × time 7200 = Res × 8
Res = 900N

3) u=12 v=60 t=4
v=u+at ⇒ 60=12+4a ⇒ 4a=48 ⇒ a=12ms⁻²
b) $S=\frac{(u+v)t}{2} \Rightarrow S=\frac{72\times4}{2}=144m$
c) u=12 S=72 a=12
$v^2=u^2+2as \Rightarrow v^2=144+24\times72 \Rightarrow v=43.3ms^{-1}$

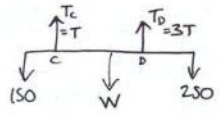
(2)

4) 

b) 

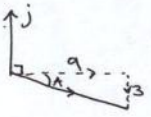
$\frac{(40+(40+x))\times20}{2}=85$
$(80+x)10=850$
$80+x=85$
$x=5sec$
c) 

$\frac{(35+45)\times v}{2}=850$
$80v=1700 \Rightarrow v=21.25ms^{-1}$

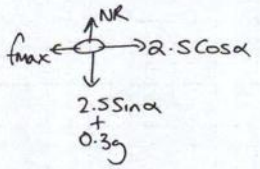
5) 

Rf ↑=0 ⇒ 4T = 400+W
A↻ W×5+250×10 = T×1+3T×4
5W+2500 = 22T
W = 4T−400 ⇒ 5W = 20T−2000
⇒ 20T−2000+2500 = 22T
2T = 500 ⇒ T = 250N
c) W = 4(250)−400 = 600N
d) weight acts at the middle of the girder.

(3)

6) Rf = (6i+2j)+(3i−5j) = 9i−3j N
b) 

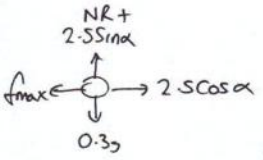
angle = 90+A
$=90+\tan^{-1}(\frac{3}{4})$
$=108°$
c) $acc=\frac{\text{change in vel}}{\text{time}} \Rightarrow Rf=ma.$
$(9i-3j)=3a \quad a=3i-j\ ms^{-2}$
d) Vel = (Initial vel)+t(acc)
Vel = (−2i+j)+2(3i−j) = 4i−j ms⁻¹
$=\sqrt{4^2+1^2}=4.12ms^{-1}$

7) 

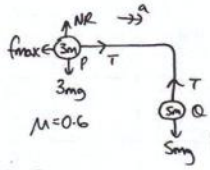
$\tan\alpha=\frac{3}{4}$


$\sin\alpha=\frac{3}{5}$
$\cos\alpha=\frac{4}{5}$
NR = 2.5×3/5 + 0.3g = 4.44N
fmax = μNR ⇒ fmax = 4.44μ.
Rf = 0 ⇒ 2.5×4/5 = fmax ⇒ fmax = 2
$=\mu=\frac{2}{4.44}=0.45$

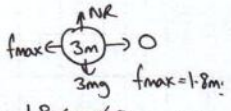
(4)

b) 

NR = 0.3g − 2.5×3/5
NR = 1.44
fmax = μNR = 0.6SN
2.5Cosα = 2.5×4/5 = 2N
So the ring will move since Rf = 1.3SN

8) 

(P) T − fmax = 3ma
(Q) 5mg − T = 5ma +
5mg − fmax = 8ma.
5mg − 1.8mg = 8ma
3.2g = 8a
$a=\frac{3.2}{8}g=\frac{2}{5}g$ ms⁻²
(P) NR = 3mg
fmax = μNR = 1.8mg
c) T = 3ma + fmax
T = 3m×2/5 g + 1.8mg = 3mg N
d) u↓=0 v²=u²+2as
a↓=2/5 g v²=4/5 gh
s=h v=√(4/5 gh) ms⁻¹
u=√(4/5 gh) v=0 a=−1.8g.
V²=u²+2as ⇒ 0 = 4/5 gh − 3.6s. $S=\frac{\frac{4}{5}gh}{3.6}=\frac{2}{9}gh$



fmax = 1.8m
−1.8×g = ma a = −1.8g