

MI June 05

1) $u=2$
 $t=20$
 $v=74$
 $v=u+at \Rightarrow 74=2+a \times 20$
 $\Rightarrow 72=20a$
 $\Rightarrow a=3.6 \text{ ms}^{-2}$

b) $S=\frac{(u+v)t}{2} \Rightarrow S=\frac{(2+74) \times 20}{2} = 760 \text{m}$
 $A \text{ to } B$
 $BC = 1200 - 760 = 440 \text{m}$

2) $\begin{matrix} \vec{8} & \vec{2} & \dots & \vec{v} & \vec{2v} \\ \textcircled{0.6} & \textcircled{0.2} & & \textcircled{0.6} & \textcircled{0.2} \end{matrix}$
Total before = $0.6 \times 8 + 0.2 \times 2 = 4.4 \text{Ns}$
Total after = $0.6v + 0.2 \times 2v = v$
 $v = 4.4 \text{ms}^{-1}$

b) Mom B before = $0.2 \times 2 = -0.4 \text{Ns}$
Mom B after = $0.2 \times 8.8 = 1.76 \text{Ns}$
Impulse = 2.16Ns

3) $\tan \alpha = \frac{3}{4}$
 $\sin \alpha = \frac{3}{5}$
 $\cos \alpha = \frac{4}{5}$

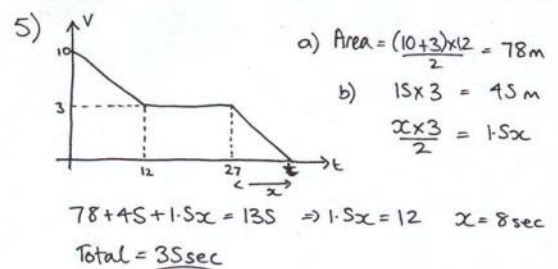
 $R \cos \alpha = T \sin \alpha$
 $R \sin \alpha = W$
 $R \cos \alpha = 4$
 $R \sin \alpha = 3$
 $\frac{4}{3} T = 6 \Rightarrow T = 7.5 \text{N}$
 $R \sin \alpha = 3 \Rightarrow R = 7.5 \times \frac{3}{4} = 5.625 \text{N}$
 $R \cos \alpha = 4 \Rightarrow R = 5$
 $W = 3$

4)
 $R \cos 20 = T \sin 20$
 $R \sin 20 = 2g + f_{\max}$
 $f_{\max} = \mu NR = 11.05 \text{N}$
 $0.246 = 2a \Rightarrow a = 0.12 \text{ms}^{-2}$

c)
 $R \cos 15 = T \sin 15$
 $R \sin 15 = 900 + 300$
 $R \cos 15 = 900 \times \frac{1}{\sin 15}$
 $R \cos 15 = 3516$
 $T = 534.2 \text{N}$

d) before
after
 $NR = 900g$
NR increases when tow bar breaks.

8) speed = $\sqrt{5^2 + 8^2} = 9.48 \text{ms}^{-1}$
b) Position = $(2i + j) + t(5i + 8j) = (2+5t)i + (1+8t)j$
c) due North means i value is the same
 $2+5t = 10 \Rightarrow 5t = 8 \Rightarrow t = 1.6 \text{sec}$
d) $B = (10i + 7j) + (0i + vj)t = 10i + (7+vt)j$
 $\Rightarrow t = 1.6 \Rightarrow 1+8t = 7+vt$
 $\Rightarrow 1+12.8 = 7+1.6v \Rightarrow 1.6v = 6.8$
 $v = 4.25 \text{ms}^{-1}$
e) friction of ball on the floor.



6)
A2 $NR_c \times 2 = 12g \times 1.5$
 $2NR_c = 18g$
 $NR_c = 9g \text{N}$

b)
A2 $NR_c \times 2 = 12g \times 1.5 + 48g \times x$
 $2NR_c = 18g + 48gx$
 $60g = 18g + 48gx$
 $x = \frac{42g}{48g} = 0.875$

7)
 $R \cos 15 = T \sin 15$
 $R \sin 15 = 900 + 300$
 $R \cos 15 = 900 \times \frac{1}{\sin 15}$
 $R \cos 15 = 3516$
 $T = 534.2 \text{N}$