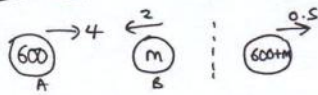
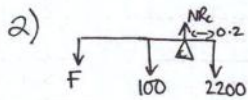


MI JAN 04

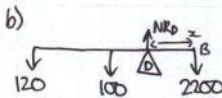


Total mom before = $600 \times 4 + -2 \times m = 2400 - 2m$
 Total mom after = $(600+m) \times 0.5 = 300 + \frac{1}{2}m$
 $\Rightarrow 2400 - 2m = 300 + \frac{1}{2}m \Rightarrow 2\frac{1}{2}m = 2100$
 $\Rightarrow m = 840 \text{ kg}$

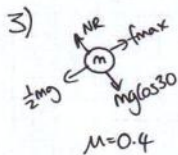
b) Mom A before = 2400 Ns
 Mom A after = $600 \times 0.5 = 300 \text{ Ns} \Rightarrow \text{Impulse} = 2100 \text{ Ns}$



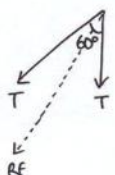
$\circlearrowleft 2200 \times 0.2 = 100 \times 0.8 + F \times 1.8$
 $440 = 80 + 1.8F$
 $1.8F = 360$
 $F = 200 \text{ N}$



$NR_0 = 120 + 100 + 2200 = 2420 \text{ N}$
 $B \downarrow 2420 \times x = 100 \times 1 + 120 \times 2$
 $2420x = 340$
 $x = 0.14 \text{ m}$

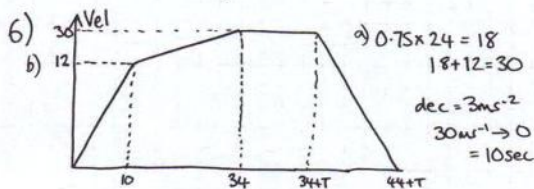


$NR = 0.866mg$ $f_{max} = \mu NR = 0.34g$
 $Rf = ma \Rightarrow \frac{1}{2}mg - 0.346mg = ma$
 $0.154g = a$ $a = 1.5 \text{ ms}^{-2}$



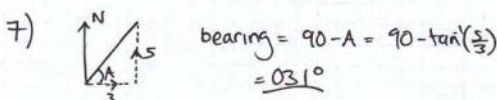
Isosceles
 $R^2 = T^2 + T^2 - 2T^2 \cos 120$
 $R^2 = 3T^2$
 $R^2 = 1905 \cdot 12$
 $R = 43.6 \text{ N}$

c) 'light' - same tension in string at A and B. no weight.



a) $A = \frac{10 \times 12}{2} + \frac{(12+30) \times 24}{2} = 60 + 504 = 564 \text{ m}$

d) $564 + T \times 30 + \frac{30 \times 10}{2} = 3000$
 $\Rightarrow 30T = 2286 \Rightarrow T = 76.2 \text{ sec}$

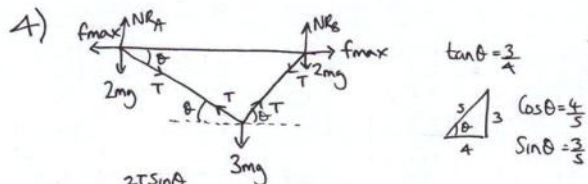


bearing = $90 - A = 90 - \tan^{-1}(\frac{5}{3}) = 031^\circ$
 a) $A = 0i + 0j + t(0i + 9j) = 9tj$
 $B = -10i + 0j + t(3i + 5j) = (-10+3t)i + 5tj$

1

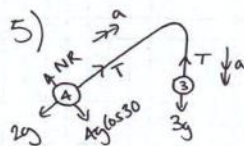
b) $s=3$ $u=0$ $a=1.5$
 $v^2 = u^2 + 2as \Rightarrow v^2 = 9 \Rightarrow v = 3 \text{ ms}^{-1}$

c) 1.5 ms^{-2}



$\circlearrowleft 2T \sin \theta$
 $T \cos \theta = 3mg$
 $\Rightarrow 2T \times \frac{3}{5} = 3mg$
 $T = \frac{5}{2} mg$

\circlearrowleft $f_{max} \leftarrow \begin{matrix} NR_A \\ \downarrow 2mg \\ T \sin \theta \end{matrix} \rightarrow T \cos \theta$
 $NR_A = 2mg + \frac{5}{2} mg \times \frac{3}{5}$
 $NR_A = 3.5mg$
 $f_{max} = \mu \times NR = \mu \times 3.5mg$
 $Rf = 0 \Rightarrow T \cos \theta = f_{max} \Rightarrow \frac{4}{5} \times \frac{5}{2} mg = \mu \times 3.5mg$
 $2 = \mu \times 3.5 \Rightarrow \mu = \frac{4}{7}$



$3g - T = 3a$
 $T - 2g = 2a$
 $g = 7a \Rightarrow a = \frac{1}{7}g \text{ ms}^{-2}$
 $T = 4a + 2g \Rightarrow T = \frac{18}{7}g \text{ N}$

3

c) B is due south of A when values of i are equal
 $\Rightarrow -10 + 3t = 0 \Rightarrow 3t = 10 \Rightarrow t = 3\frac{1}{3} = 3 \text{ hrs } 20 \text{ min}$
1520

d) $\text{dist} = (0 - (-10+3t))i + (9t - (5t))j$
 $= (10-3t)i + 4tj$
 $d^2 = (10-3t)^2 + (4t)^2 = 100 - 60t + 9t^2 + 16t^2$
 $d^2 = 25t^2 - 60t + 100$

e) $d=10 \Rightarrow d^2=100 \Rightarrow 25t^2 - 60t + 100 = 100$
 $25t^2 - 60t = 0$
 $5t(5t-12) = 0$
 $t=0$ $t = \frac{12}{5} = 2.4 = 2 \text{ hr } 24 \text{ min}$
1424