Ex 3D

(1) $P = 1200 \times 10 = 12\text{kW}$

(2) $P = 800 \times 12 = 9.6\text{kW}$

(3) $4000 = F \times 15 \quad F = 267\text{ N}$

(4) $4500 = T_F \times V$

NEL at Max spd $a = 0 \quad \therefore \quad T_F - R = 0 \quad T_F = 500\text{ N}$

$V = \frac{4500}{500} = 9\text{ ms}^{-1}$

(5) At Max spd $a = 0 \quad \therefore \quad T_F - R = 0 \quad T_F = 475$

Now $6000 = 475 \times V \quad V = 12.6\text{ ms}^{-1}$

(6) $7500 = T_F \times 15 \quad T_F = 500\text{ N}$

Max spd $\therefore a = 0 \quad \therefore T_F = R = 500\text{ N}$

(7) (a) when $V = 5 \quad T_F = \frac{8000}{5} = 1600\text{ N}$

Now $T_F - R = Ma \quad 1600 - 400 = 900a \quad a = 1.33\text{ ms}^{-2}$

(b) when $V = 12 \quad T_F = \frac{8000}{12} = 666\frac{2}{3}\text{ N}$

$\therefore \quad 666\frac{2}{3} - 400 = 900a \quad a = 0.296\text{ ms}^{-2}$

(c) at Max spd $a = 0 \quad \therefore T_F = R = 400\text{N}$

$\therefore \quad V = \frac{P}{T_F} = \frac{8000}{400} = 20\text{ ms}^{-1}$

(8) $T_F = \frac{12000}{15} = 800\text{ N}$

Now $T_F - R = Ma \quad 800 - R = 1000 \times 0.4 \quad R = 400\text{N}$

(9) $T_F - R = Ma$

$T_F - 250 = 800 \times 0.25$

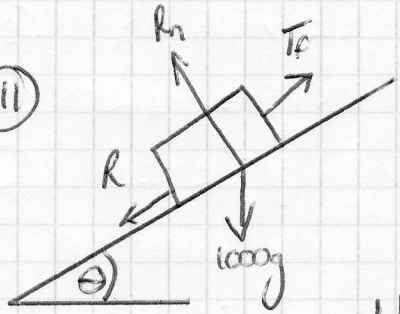
$T_F = 450\text{N}$

Now $P = T_F \times V = 450 \times 20 = 9\text{kW}$

(10) at max spd $a=0$ $\therefore T_F - R = 0$ $T_F = 30$

Now $P = T_F \times V$ $V = \frac{300}{30} = 10\,ms^{-1}$

(11)



$P = T_F \times V$

$20000 = T_F \times 25$

$\therefore T_F = 800N$

Now $T_F - R - 1000g\sin\theta = 0$

$800 - 1000g \cdot \frac{1}{20} = R$

$\therefore R = 310\,N$

On horizontal rd $T_F - R = Ma$

$800 - 310 = 1000a$

$a = 0.49\,ms^{-2}$

(12) $P = T_F \times V$ at max spd $a=0$ $\therefore T_F - R = 0$ $\therefore T_F = 400$

$P = 400 \times 35 = 14\,kW$

Now on incline $T_F - R - Mg\sin\theta = Ma$

but at max vel $a=0$ $T_F - 400 - 1000g\sin 10 = 0$

$T_F = 400 + 1000g\sin 10$

Now $P = T_F \times V$

$14000 = (400 + 1000g\sin 10)\,V$

$V = 6.66\,ms^{-1}$

(13) $15000 = T_F \times 20$ $T_F = 750N$

Now $T_F - R = 750a$

$750 - 600 = 750a$ $\therefore a = 0.2\,ms^{-2}$

On incline at max spd: $T_F - 600 - 750g\sin 6 = 0$

$T_F = 600 + 750g\sin 6$

$\therefore V_{max} = \frac{P}{T_F} = \frac{15000}{(600 + 750g\sin 6)} = 11.0\,ms^{-1}$

(14) At max spd $T_f - 200000g\sin 0.5 - 8000 = 0$

$T_f = 200000g\sin 0.5 + 8000 = 25104\ N$

Now $V = \frac{P}{T_f} = \frac{300000}{(200000g\sin 0.5 + 8000)} = 12.0\ ms^{-1}$

On horizontal: $T_f - R = ma$

$25104 - 8000 = 200000a$

$a = 0.0855\ ms^{-2}$

(15) at max spd $a = 0$ $\therefore$ $T_f - R = 0$

$T_f = 200 + 2V$

Now $P = T_f \times V$

$8000 = (200 + 2V)V$

$2V^2 + 200V - 8000 = 0$

$V = 30.6\ ms^{-1}$