Q1

$[p] = MLT^{-1}$

Q2

ai) $t = 7.2\ s$

aii) $s = 64.8\ m$

bi) $t = 3.19\ s$

bii) $s_x = 63.8\ m$

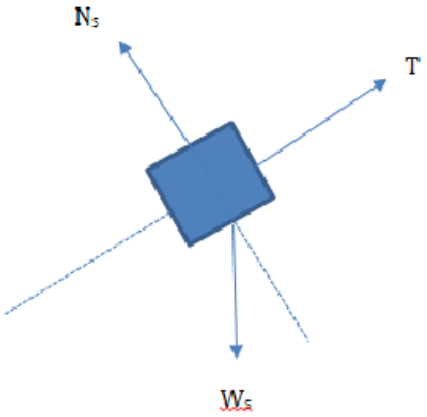
biii) $v = 37.14\ ms^{-1}$

Q3

a) $u = 30\ m\ s^{-1}$

b) $v = -2.0\ m\ s^{-1}$

ci)



Note:
Label Ws and
Wt, not just W

cii) $T = 124.4 + 30a$ _____(1) $a = 1.44\ m\ s^{-2}$

$T = 196.2 - 20a$_____(2) $T = 196.2 - 20(1.44) = 167.4\ N$

ciii) $s = 2.88\ m$

Q4

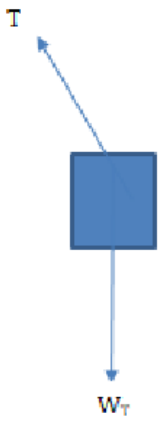
a) $v_B = 4.43\ ms^{-1}$

b) $W_{Friction} = -2.94\ J$ Work done against friction = 2.94J

c) $\mu_K = 0.499$

Q5

a)



(If u draw Tx and Ty no problem)

b) $v = 1.51\ ms^{-1}$

Q6

ai)(when it passes the equilibrium position just means when y=0)

$$v_{max} = A\omega$$
$$= 0.15(10\pi)$$
$$= 1.5\pi\ ms^{-1} = 4.71\ ms^{-1}$$

aii) $v = 3.51\ ms^{-1}$

aiii) $\sum E = 7.77\ \text{J}$

aiv) $y = 0.15\sin(10\pi t)$ (ecf for ω)

where y is in meter and t is in second

bi) $\lambda = 1.07$ m

bii) $v = f\lambda$

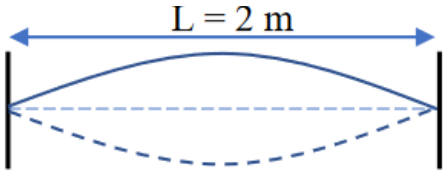
$= 34.22(1.07)$

$= 36.62$ ms^{-1}

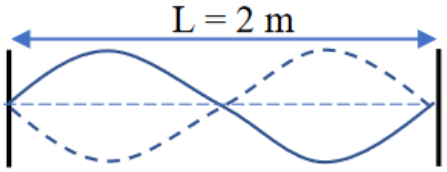
biii) Direction of wave propagation is to the left

ci)

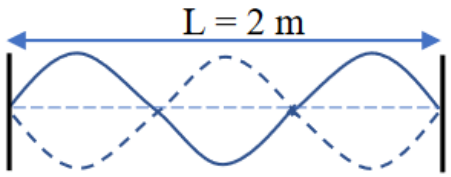
Fundamental



First overtone



Second overtone



cii) $f_2 = 100\ Hz$ $f_5 = 250\ Hz$

di)

$$f_a = \left(\frac{v}{v - v_s}\right) f_s$$

$$= \left(\frac{340}{340 - 20}\right)(2000)$$

$$= 2125\ Hz$$

dii)

$$f_a = \left(\frac{v}{v + v_s}\right) f_s$$

$$= \left(\frac{340}{340 + 20}\right)(2000)$$

$$= 1888.89\ Hz$$

Q7

a) $r_Q = 0.18\ mm$ ∴ Diameter of wire Q is $0.18 \times 2 = 0.36\ mm$

bi) $T = \dfrac{k_S T_C + k_A T_H}{k_A + k_S}$

bii) Maximum contraction $\Delta L = -0.054\ m$

Maximum expansion $\Delta L = 0.027\ m$

Q8

ai) $T_f = 518.4K$

aii) $V_f = 453\ m^3$

bi) $\overline{W_{ABC}} = -10 \times 10^4 J$

bii) $P_f = 20kPa$