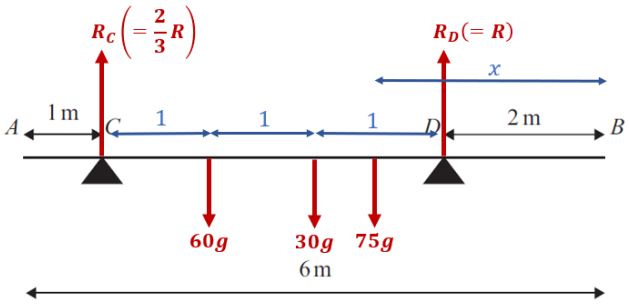
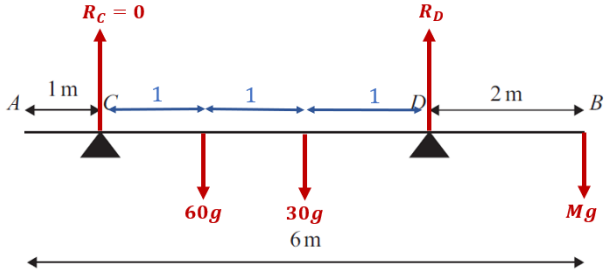
Question Number	Answer	Mark
2(a)		
	Method to form an equation in R_C or R_D only E.g. Resolve vertically $R_c + R_D = 30g + 60g + 75g$	M1
	$\frac{2}{3}R_D + R_D = 30g + 60g + 75g$	A1
	$R_D = 970$ (N) Accept 99g	A1
		(3)
2(b)	Method to form a moments equation in x only • M(B): $75gx + (30g \times 3) + (60g \times 4) = (R_C \times 5) + (R_D \times 2)$ Other possible equations: M(A): $75g(6-x) + (30g \times 3) + (60g \times 2) = (R_C \times 1) + (R_D \times 4)$ M(C): $(R_D \times 3) = (30g \times 2) + (60g \times 1) + 75g(5-x)$ M(D): $(R_C \times 3) = (30g \times 1) + (60g \times 2) + 75g(x-2)$ M(midpt): $(60g \times 1) + (R_D \times 1) = (R_C \times 2) + 75g(3-x)$	M1
	M(B): $75gx + 30g \times 3 + 60g \times 4 = "66g" \times 5 + "99g" \times 2$	A1ft
	$(x =) \frac{66}{25}$ Accept 2.64 following use of 970.2 or 99g	A1
		(3)
2(c)		
	Method to form equation in R_D only	M1
	M(B): $(R_D \times 2) = (30g \times 3) + (60g \times 4)$	A1

	R_D = 1600 or 1620 (N) Accept 165g	A1
		(3)
		(9)
	Notes for Question 2	
	Penalise use of 9.81ms^{-2} or 10ms^{-2} for g on first occurrence and only once per question.	
2(a)		
M1	Method resolving vertically, or otherwise, to form a relevant equation in R_C or R_D only. Allow both R_C and R_D for the method mark. Correct number of terms. Dimensionally correct. Condone consistent missing g for the method mark only.	
A1	Correct unsimplified equation with the correct ratio between R_C and R_D. E.g. Accept $2R+3R=30g+60g+75g$	
A1	970. Accept 99g (isw)	
2(b)		
M1	Moments equation with correct number of terms. Dimensionally correct (force $\times$ length). No need to replace R_C or R_D for the method mark. Consistent missing g may score M1A1ftA1.	
A1ft	Correct unsimplified equation in x only. Follow through their values of R_C or R_D.	
A1	Correct exact answer required, $\frac{66}{25}$. Accept equivalent exact fractions isw. Accept 2.64 following use of 970.2 or 99g	
2(c)		
M1	Complete method to obtain an equation in R_D only. Must have $R_C = 0$. If more than one equation is used, the mark is only awarded when an equation in R_D only is formed. Condone consistent missing g for the method mark only. M0 for using values of R_C or R_D from previous parts. Other possible equations: $\mathrm{M}(A): 6Mg+30g\times3+60g\times2=4R_D$ $\mathrm{M}(C): 5Mg+30g\times2+60g\times1=3R_D$ $\mathrm{M}(D): 2Mg=30g\times1+60g\times2 \Rightarrow M=75$ $60g+30g+Mg=R_D$	
A1	Correct equation in R_D only.	

A1	1600 or 1620. Accept 165*g* (isw)	

3. A train travels between two points, A and B, on a straight horizontal track.

The train usually travels at a constant speed of $50\,\text{m s}^{-1}$ for 15 minutes between the two points.

On one occasion, the train was delayed, because of signals. Figure 2 shows a sketch of the speed-time graph for the motion of the train on this occasion.

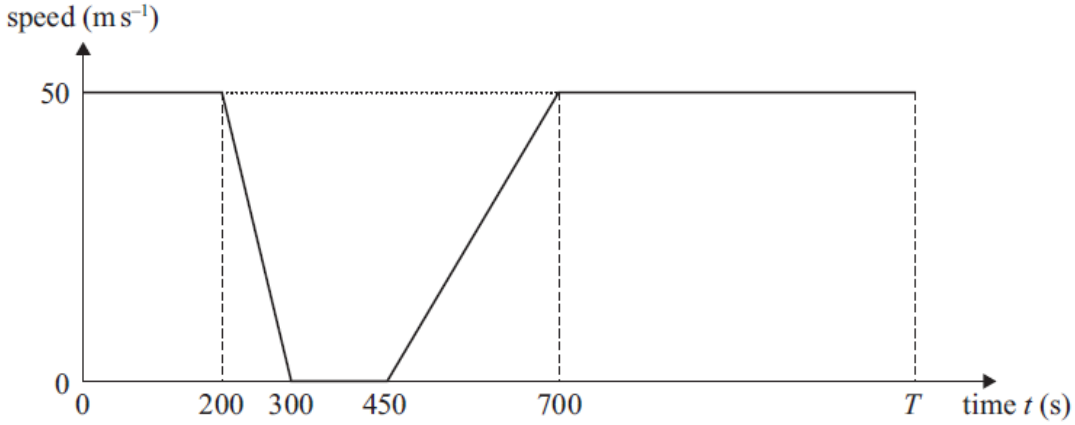


Figure 2

On this occasion, the train passes A at time $t = 0$ and passes B at time $t = T$ seconds.

(a) Find the deceleration of the train while it was slowing down.

(2)

(b) Sketch an acceleration-time graph for the motion of the train, from $t = 0$ to $t = T$ seconds, on this occasion.

(2)

(c) Find the value of T.

(4)

(d) Find the total length of time, between $t = 0$ and $t = T$ seconds, for which the speed of the train was less than $30\,\text{m s}^{-1}$ on this occasion.

(4)