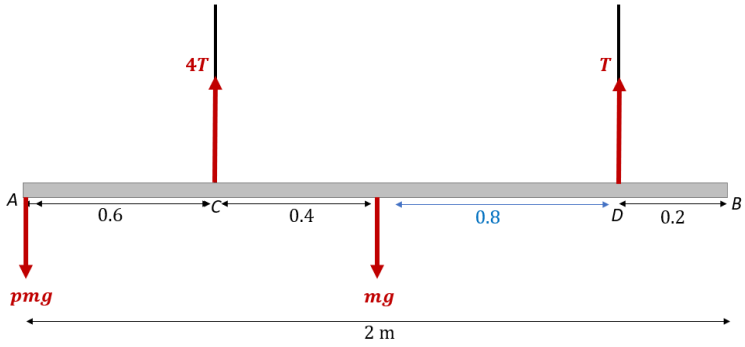
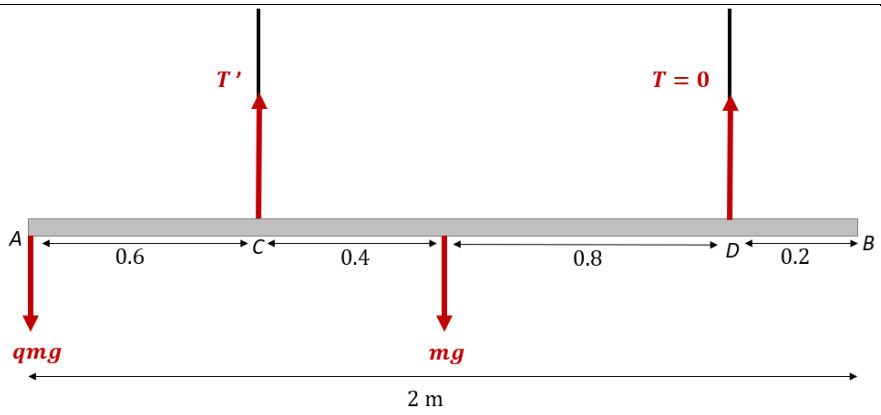
Question Number	Scheme	Marks
4(a)	T and $4T$ correctly placed	B1
	Vertical resolution $T+4T=pmg+mg$ **OR** a moments equation, see below.	M1 A1
	$\mathrm{M}(A):\ (4T\times0.6)+(T\times1.8)=(mg\times1)$  Other moments equations: $\mathrm{M}(C):\ (pmg\times0.6)+(T\times1.2)=(mg\times0.4)$ $\mathrm{M}(G):\ (pmg\times1)+(T\times0.8)=(4T\times0.4)$ $\mathrm{M}(D):\ (pmg\times1.8)+(mg\times0.8)=(4T\times1.2)$ $\mathrm{M}(B):\ (4T\times1.4)+(T\times0.2)=(pmg\times2)+(mg\times1)$	M1 A1
	Eliminate T $5\left(\frac{5mg}{21}\right)=pmg+mg$	M1
	$p=\frac{4}{21}$ (exact ratio of 2 positive integers)	A1
		(7)
4(b)	Tension at D is zero, seen or implied.	B1
	$\mathrm{M}(C):\ (qmg\times0.6)=(mg\times0.4)$	M1 A1
	$q=\frac{2}{3}$ (exact ratio of 2 positive integers), accept 0.666….. or $0.\dot{6}$	A1
		(4)
4(c)	The centre of mass (or gravity) of the beam is in the middle; the mass (weight) of the beam acts at the middle, mass at centre, centre of mass at the centre. Penalise incorrect extras.	B1
		(1)
		(12)

Notes for Question 4	
(a)	**N.B.** Full marks can be scored if consistent omission of g's in a **complete solution,** but otherwise penalise omission of g's
B1	Correct relationship between the tensions and placed correctly, seen or implied.
M1	Vertical resolution. Condone forces at C and D the wrong way round or written as T_C and T_D. This equation may be replaced with a moments equation.

A1	Correct unsimplified equation (even if T and $4T$ are the wrong way round on their diagram)
M1	Moments equation. Correct forces multiplied by a length. Condone consistent forces at C and D the wrong way round or written as T_C and T_D
A1	Correct unsimplified equation, **in a variable consistent with their first equation.**
M1	Eliminate T to give an equation in p only allow extra m's or g's or both
A1	Cao. Must be exact.
	N.B. If they write down more than two equations, award the marks for those equations which they use to solve the problem.
(b)	
B1	Recognise tension at D is 0, seen or implied
M1	Complete method to obtain an equation q only. e.g. Moments about C equation.
A1	Correct unsimplified equation in q only.
A1	Cao. Must be exact.
ALT (b)	
M1	Two other equations could be used and solved to find q. M0 if tension at D is never zero.
A1	Correct unsimplified equation in q only.
A1	Cao. Must be exact.
	 Alternative equations: $\text{vert}: \quad T' = qmg + mg$ $\text{M}(A): \ (T' \times 0.6) = (mg \times 1)$ $\text{M}(G): \ (qmg \times 1) = (T' \times 0.4)$ $\text{M}(D): \ (qmg \times 1.8) + (mg \times 0.8) = (T' \times 1.2)$ $\text{M}(B): \ (qmg \times 2) + (mg \times 1) = (T' \times 1.4)$
(c)	
B1	Any appropriate comment