

| Question Number | Scheme | Marks | Notes |
|-----------------|--|-------------|---|
| 3(a) | moments equation | M1 | All terms required. Dimensionally correct Condone sign errors |
| | $M(C)$, $Mg \times 1.5 + 100g \times 3.5 = 637 \times 7$ $M(A)$: $2Mg + 400g = \frac{1}{2}T + 7.5 \times 637$ $M(P)$: $1.5T + 100g \times 2 = 637 \times 5.5$ | A1 | Correct unsimplified equation |
| | Resolve vertically or a second moments equation | M1 | All terms required. Dimensionally correct Condone sign errors |
| | (↑), $T + 637 = Mg + 100g$ | A1ft | Correct unsimplified equation in M or their M , T or their T |
| | (i) $M = 70$ | A1 | $69.99\dots = 70$ is A0 (from 9.81) |
| | (ii) $T = 1000\text{N}$ or 1030 N | A1 | Not 1029, not 105g |
| | | | They need to form two independent equations. M1A1 for first equation seen M1A1ft for the second equation (ft on any result from the first eqn) A1 for M , A1 for T . |
| | | (6) | |
| (b) | Assumed that the beam remains straight | B1 | Not flexible B1, Does not bend B1, Extra irrelevant (e.g. centre of mass at midpoint) B0 |
| | | (1) | |
| (c) | $T + T = 60g + 100g + 48g$ ($T = 104\text{g}$ or 1019.2N) | M1 | Resolve vertically. Need all terms. Equal T s. Condone sign errors |
| | Moments equation | M1 | All terms required. Dimensionally correct. Not using T from (a) Condone sign errors |
| | $M(C)$, $60g \times 1.5 + 100g \times 3.5 + 48g \times (x - 0.5) = T \times 7$ $M(A)$: $60g \times 2 + 100g \times 4 + 48gx = 0.5T + 7.5T$ $M(B)$: $0.5T + 7.5T = 48g(8-x) + 4 \times 100g + 6 \times 60g$ $M(D)$: $100g \times 3.5 + 48g(7.5-x) + 60g \times 5.5 - 7T = 0$ | A1 | Correct unsimplified equation |
| | Solve for x | DM1 | Solve for our x . Dependent on both preceding M marks |
| | $x = 6.5 \text{ (m)}$ | A1 | |
| | Watch out for “correct” answer from working that ignores the $100g$ | (6) (13) | As above, M1A1 for two independent equations, then DM1A1 for solving |