| **Question** | **Scheme** | **Marks** |
| --- | --- | --- |
| **1** |  |  |
|  | B1 |
|  | M1 |
|  =78*g* | A1 |
|  |  |
| *P* | 2.5 × 18*g* cos *α* + 3 × 60*g* cos *α* = 5F sin *α* | M1 A1 A1 |
| *A* | 18*g* × 2.5 cos *α* + 60*g* × 3 cos *α* = *R* × 5 sin *α*  |  |
| *C* | ½ cos *α* × 18*g +* 3 sin *α F* + 2 sin *α R* = 3 cos *α N* |  |
| *B* | 5 cos *α N* = 5 sin *α F* + 2.5 cos *α* × 18*g* + 2 cos *α* × 60*g* |  |
| *W* | 60*g* × ½ cos *α +* 2.5*N* cos *α* = 2.5*R* sin *α* + 2.5*F* sin *α* |  |
|  |  | DM1 |
|  |  |
|  | M1 |
|  | A1 |
|  |  | **(9 marks)** |
| **2(a)** | *M*(*A*), *F*  4 sin 40° = 5*g* 2cos 25° | A complete method to fond *F*, e.g. take moments about *A*.Condone sin/cos confusion. Requires correct ratio of lengths. | M1 |
| Correct terms with at most one slip | A1 |
| All correct  | A1 |
| *F* = 35 | 35 or 34.5 (>3sf not acceptable due to use of 9.8, but only penalise once in a question | A1 |
|  |  | **(4)** |
| **2(b)** | *F* cos 75° ± *Y* = 5*g* | Resolve vertically. Need all three terms but condone sign errors. Must be attempting to work with their 75° or 15°.  | M1 |
| Correct equation (their *F*) | A1 |
| *Y* = 40 | 40 or 40.1Apply ISW if the candidate goes on to find *R*.  | A1 |
| UP | Cso (the Q does specifically ask for the direction, so must be clearly stated) | A1 |
|  |  | **(4)** |
|  |  | **(8 marks)** |
| **3** |  |  |
| Resolve horizontally or vertically:  | M1 |
|  or  | A1 |
| Take moments about *A* or *B.* | M1 |
| *M*(*A*): *M*(*B*):  | A2 |
| or   | M1 |
|  | dM1 |
|  | dM1 |
|  | A1 |
|  |  | **(9 marks)** |
| **4** |  | M1 A1 |
|  | **(2)** |
|  | M1 |
| 3 independent equations required. Award M1A1 for each in the order seen. If more than 3 relevant equations seen, award the marks for the best 3. |
|  | M1 A1 |
|  | M1 A1 |
|  | M1 A1 |
| M(C)  |  |
| Parallel:  |  |
| Perpendicular:  |  |
|  | DM1A1 |
| Reactions in the wrong direction(s) – check carefully |  |
|  |  | **(9)** |
|  |  | **(11 marks)** |
| **5(a)** | VH |  |
| Moments about A: | M1 |
|  | A2 |
|  **\*Answer given\*** | A1 |
|  |  | **(4)** |
| **5(b)** |   | M1A1 |
|   | M1A1 |
|   | A1 |
|  |  | **(5)** |
| **5(c)** |  | M1A1 |
| ,  | DM1A1 |
|  |  | **(4)** |
|  |  | **(13 marks)** |
| **6(a)** | Taking moments about A: | M1 |
|  | A1 A1 |
| *T* = 18.4 N | A1 |
|  |  | **(4)** |
| **6(b)** | ↑  |  |
|   | M1 A1 |
| →  | M1 A1 |
|  | M1 A1 |
|  | A1 |
|  |  | **(7)** |
|  |  | **(11 marks)** |
| **7(a)** | Resolving vertically:  | M1 |
|  | A1 |
| Moments about *A*:   | M1 |
|  | A1 |
|  **\*\*** | DM1 |
| A1 |
|  |  | **(6)** |
| **7(b)** | NB  with correct conclusion is possible |  |
|  | B1 |
|  | M1 |
|  = | DM1 |
| A1 |
| Resultant at *A* =  (0.79*W*) | DM1 |
| A1 |
|  |  | **(6)** |
|  |  | **(12 marks)** |
| **8** |  |  |
| Taking moments about A: |  |
|   | M1 A1 |
| Resolving vertically: |  |
|  | M1 A1 |
| Resolving horizontally: |  |
|   | M1 A1 |
| (Most alternative methods need 3 independent equations, each one worth M1A1. Can be done in 2 e.g. if they resolve horizontally and take moments about *X* then  scores M2A2) |  |
| Substitute trig values to obtain correct values for F and R (exact or decimal equivalent). | DM1 |
| ,  ,  | A1 |
|  .  | M1 |
|  | A1 |
|  |  | **(10 marks)** |
| **9(a)** |  |  |
|  | M1 A2,1,0 |
|   |  |
|  |  |
|  | M1 |
|   |  |
|   **\*\*** | A1 |
|  |  | **(5)** |
| **9(b)** |  | M1 |
|  | A1 |
|  **\*\*** | A1 |
|  |  | **(3)** |
| **9(c)** |   | M1 A2,1,0 |
|  |  |
|   | DM1 A1 |
|  |  | **(5)** |
|  |  | **(13 marks)** |

|  |  |  |  |  |  |
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|  | **Source paper** | **Question number** | **New spec references** | **Question description** | **New AOs** |
| 1 | M2 Jan 2013 | 3 |   | Statics of rigid bodies | 1.1b, 1.2, 3.1b |
| 2 | M2 2012 | 3 |   | Statics of rigid bodies | 1.1b, 2.1, 2.2a, 3.1b |
| 3 | M2 2015 | 4 |   | Statics of rigid bodies | 1.1b, 2.1, 3.1b, 3.3 |
| 4 | M2 2013R | 4 |   | Statics of rigid bodies | 1.1b, 2.1, 3.1b, 3.4 |
| 5 | M2 2013 | 5 |   | Statics of rigid bodies | 1.1b, 2.1, 2.2a, 3.1b |
| 6 | M2 Jan 2012 | 5 |   | Statics of rigid bodies | 1.1b, 1.2, 2.2a, 3.1b |
| 7 | M2 2014 | 7 |   | Statics of rigid bodies | 1.1b, 2.1, 2.2a, 3.1b |
| 8 | M2 Jan 2011 | 7 |   | Statics of rigid bodies | 1.1b, 1.2, 2.1, 2.2a, 2.5, 3.1b |
| 9 | M2 2011 | 7 |   | Statics of rigid bodies | 1.1b, 1.2, 2.2a, 3.1b |