

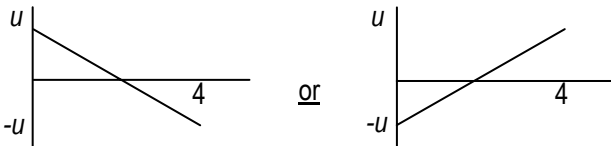
Mark Scheme (Results)

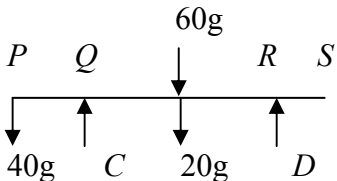
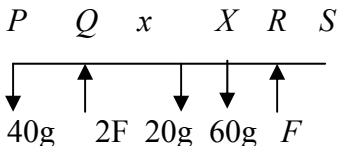
January 2009

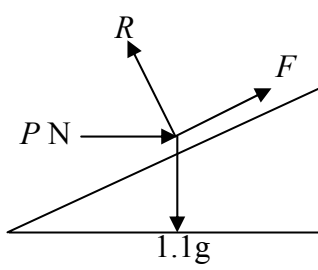
GCE

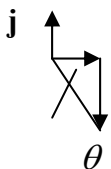
GCE Mathematics (6677/01)

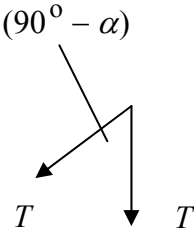
January 2009
6677 Mechanics M1
Mark Scheme

| Question Number | Scheme | Marks |
|-----------------|---|--|
| 1 | $-6\mathbf{i} + \mathbf{j} = \mathbf{u} + 3(2\mathbf{i} - 5\mathbf{j})$ $\Rightarrow \mathbf{u} = -12\mathbf{i} + 16\mathbf{j}$ $\Rightarrow u = \sqrt{(-12)^2 + 16^2} = 20$ | M1 A1 A1 cso M1 A1 [5] |
| 2 | <p>(a)</p>  <p style="text-align: center;"><u>or</u></p> <p style="text-align: right;">shape values</p> <p>(b)</p> $19.6 = \frac{1}{2} \times 2 \times u$ $u = 19.6$ | B1 B1 (2) M1 A1 A1 (3) [5] |
| 3 | <p>(a)</p> $2u \rightarrow \leftarrow 4u \quad km2u - 4mu = -kmu + mv$ $km \quad m \quad u(3k - 4) = v$ $u \leftarrow \rightarrow v$ <p>(b)</p> $k > 2 \Rightarrow v > 0 \Rightarrow \text{dir}^n \text{ of motion reversed}$ <p>(c)</p> <p>For B, $m(u(3k - 4) - 4u)$ $= 7mu$</p> | M1 A1 A1 (3) M1A1A1 cso (3) M1 A1 f.t. A1 (3) [9] |

| Question Number | Scheme | Marks |
|-----------------|---|---|
| 4 (a) |  $C + D = 120g$ $M(Q), 80g \cdot 0.8 - 40g \cdot 0.4 = D \cdot 1.6$ <p>solving</p> $C = 90g; D = 30g$ | <p>M1 A1 M1 A1</p> <p>M1 A1 A1 (7)</p> |
| (b) |  $2F + F = 40g + 20g + 60g$ $M(Q), 60gx + 20g \cdot 0.8 = 40g \cdot 0.4 + F \cdot 1.6$ <p>solving</p> $QX = x = \frac{16}{15} \text{ m} = 1.07\text{m}$ | <p>M1 A1</p> <p>M1 A1 M1</p> <p>A1 (6) [13]</p> |

| Question Number | Scheme | Marks |
|-----------------|---|---|
| 5 (a) |  | <p>B2 -1 e.e.o.o. (labels not needed)</p> <p>(2)</p> |
| (b) | $F = \frac{1}{2} R$ $(\uparrow), R \cos \alpha + F \sin \alpha = mg$ $R = \frac{1.1g}{(\cos \alpha + \frac{1}{2} \sin \alpha)} = 9.8 \text{ N}$ $(\rightarrow), P + \frac{1}{2} R \cos \alpha = R \sin \alpha$ $P = R(\sin \alpha - \frac{1}{2} \cos \alpha)$ $= 1.96$ | <p>B1</p> <p>M1 A2</p> <p>M1 A1 (6)</p> <p>M1 A2</p> <p>M1</p> <p>A1 (5)</p> <p>[13]</p> |

| Question Number | Scheme | Marks |
|-----------------|---|---|
| 6 (a) |  $\tan \theta = \frac{2}{1} \Rightarrow \theta = 63.4^\circ$ <p>angle is 153.4°</p> | M1 A1 A1 (3) |
| (b) | $(4 + p)\mathbf{i} + (q - 5)\mathbf{j}$ $(q - 5) = -2(4 + p)$ $2p + q + 3 = 0 *$ | B1 M1 A1 A1 (4) |
| (c) | $q = 1 \Rightarrow p = -2$ $\Rightarrow \mathbf{R} = 2\mathbf{i} - 4\mathbf{j}$ $\Rightarrow \mathbf{R} = \sqrt{2^2 + (-4)^2} = \sqrt{20}$ $\sqrt{20} = m8\sqrt{5}$ $\Rightarrow m = \frac{1}{4}$ | B1 M1 M1 A1 f.t. M1 A1 f.t. A1 cao (7) [14] |

| Question Number | Scheme | Marks |
|-----------------|--|---|
| 7 (a) | $T - 5g \sin \alpha = 5a$ $15g - T = 15a$ <p>solving for a</p> $a = 0.6g$ <p>solving for T</p> $T = 6g$ | <p>M1 A1</p> <p>M1 A1</p> <p>M1</p> <p>A1</p> <p>M1</p> <p>A1 (8)</p> |
| (b) | <p>For Q :</p> $\begin{array}{l} 5g - N = 5a \\ N = 2g \end{array}$ | <p>M1 A1</p> <p>A1 f.t. (3)</p> |
| (c) |  $F = 2T \cos\left(\frac{90^\circ - \alpha}{2}\right)$ $= 12g \cos 26.56^\circ$ $= 105 \text{ N}$ | <p>M1 A2</p> <p>A1 f.t.</p> <p>A1 (5)</p> <p>[16]</p> |