

EDEXCEL FOUNDATION

Stewart House 32 Russell Square London WC1B 5DN

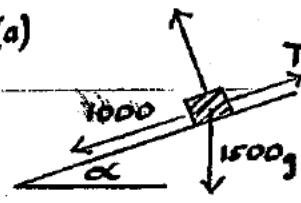
January 2002

Advanced Supplementary/Advanced Level

General Certificate of Education

Subject MECHANICS 6678

Paper No. M2

Question number	Scheme	Marks
1.	<p>Work done = Loss in K.E.</p> $R \times 200 = \frac{1}{2} \times 4 \times 25^2$ $R = 6.25$	<p>MI AI = AI</p> <p>AI <u>4</u> (4)</p>
2.	<p>(a) </p> $T = \frac{P}{v} = \frac{60\,000}{30} (=2000)$ <p>N2L: $2000 - 1000 - 1500 \times 9.8 \times \frac{1}{12}$ $= 1500 a$ $a = (-) 0.15 \text{ (ms}^{-2}\text{)} \text{ cao}$</p> <p>(b) $T' = 1000 + 1500 \times 9.8 \times \frac{1}{12} (=2225)$ $P = T'v \quad 30\,000 = 2225 v$ $v \approx 36 \text{ (ms}^{-1}\text{)} \text{ accept } 36.0$</p> <p>(c) The resistance is likely to increase with speed</p>	<p>BI</p> <p>MI AI</p> <p>AI <u>4</u></p> <p>MI</p> <p>AI <u>4</u></p> <p>BI <u>1</u> (9)</p>
3.	<p>(a) $\underline{a} = 6t \underline{i} + 6\underline{j}$ $t=2 \quad \underline{a} = 12\underline{i} + 6\underline{j}$ N2L $\underline{F} = m\underline{a} = 3.6\underline{i} + 1.8\underline{j}$ $\underline{F} = \sqrt{(3.6^2 + 1.8^2)} \approx 4.02 \text{ (accept } 4.03\text{)} \text{ cao}$</p> <p>(b) $\underline{r} = (t^3 + C_1)\underline{i} + (3t^2 - 4t + C_2)\underline{j}$ ignore constants Using $t=0$, $\underline{r} = (t^3 + 3)\underline{i} + (3t^2 - 4t - 4)\underline{j}$ $\underline{E} = 4$, $\underline{r} = 67\underline{i} + 28\underline{j} \text{ (m)}$</p>	<p>MI</p> <p>AI</p> <p>MI</p> <p>MI AI <u>5</u></p> <p>MI AI + AI</p> <p>MI</p> <p>AI <u>5</u> (10)</p>

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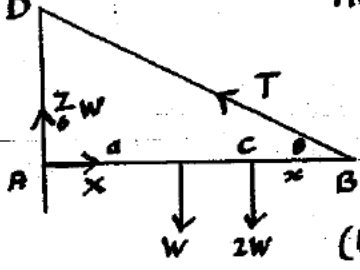
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Paper No. 1

Question number	Scheme	Marks
4	<p>(a) ABC $WXYZ$ Template Mass ratio $48a^2$ $4a^2$; $44a^2$ C.M. $\frac{8a}{3}$ $2a$ \bar{x}</p> <p>$M(AB) = 44a^2 \bar{x} + 8a^3 = 48a^2 \times \frac{8a}{3}$ solving to $\bar{x} = \frac{30}{11}a$ * CSO</p> <p>(b) $M(CAB)$ or $M(ZY)$ $KM \times 8a + M \times \frac{30}{11}a = M(1+K)3a$ $KM \times 5a = M(3a - \frac{30}{11}a)$ solving to $K = \frac{3}{55}$ $K = \frac{3}{55}$ or 0.055</p>	<p>BI; BI/ BI BI MI AI AI <u>7</u></p> <p>MI A2(1,0) AI <u>4</u></p>
5	 <p>(a) $M(A) T \times 2a \sin \theta = Wa + 2W(2a - x)$ $T \times \frac{6}{5}a = 5Wa - 2Wx$ $T = \frac{5(5a - 2x)}{6a}W$ CSO</p> <p>(b) $M(B) \frac{7}{6}W \times 2a = Wa + 2Wx$ $x = \frac{2}{3}a$ O.E.</p> <p>(c) $R(\rightarrow) X = T \cos \theta = \frac{5}{6}(5 - \frac{4}{3})W \times \frac{4}{5}$ $= \frac{22}{9}W$</p>	<p>MI A2(1,0) MI AI <u>5</u></p> <p>MI AI <u>3</u> MI AI <u>4</u></p>
	<p>Alternative to (b)</p> <p>$R(\uparrow) \frac{7}{6}W + T \sin \theta = 3W$ $\frac{7}{6}W + \frac{5(5a - 2x)W}{6a} \times \frac{3}{5} = 3W$ $x = \frac{2}{3}a$</p>	<p>MI AI AI <u>3</u></p>

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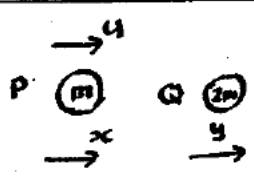
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Paper No. M2

Question number	Scheme	Marks
6.	 <p>(a) LM $mu = mx + 2my$ NEL $x - y = -eu$ Solving to $y = \frac{1}{3}(1+e)u \neq \text{cso.}$</p> <p>(b) Obtaining $x = \frac{1}{3}(1-2e)u$ allow angular Direction unchanged implies $x > 0$ $e < \frac{1}{2}$ ignore $e \geq 0$</p> <p>(c) $y = \frac{5}{12}u, x = \frac{1}{6}u$ Final K.E = $\frac{1}{2}m(\frac{1}{6}u)^2 + \frac{1}{2}2m(\frac{5}{12}u)^2 (= \frac{27}{144}mu^2)$ Loss in K.E = $\frac{1}{2}mu^2 - \frac{27}{144}mu^2 = \frac{5}{16}mu^2$</p> <p>(d) Heat, sound, (work done by) internal forces</p>	<p>BI MI AI MI AI <u>5</u> MI AI AI <u>4</u> MI AI MI AI <u>4</u> BI <u>1</u> (14)</p>
7	<p>(a) (\uparrow) $u_y = 80 \sin 60^\circ, v_y = 0$ $0^2 = (80 \sin 60^\circ)^2 - 2 \times 9.8 \times s$ $s \approx 244.9$ Height is 260 m. Accept 265</p> <p>(b) $0 = 80 \sin 60^\circ - 9.8t$ $t = 7.1$ (s) Accept 7.07</p> <p>(c) (\rightarrow) $u_x = 80 \cos 60^\circ (= 40)$ LM $100 \times 40 = 40 \times v + 60 \times 80$ $v = (-)20 \neq$ cso</p> <p>(d) Let N be point on ground vertically below B $ON = 80 \cos 60^\circ \times \text{time (b)} (= 282.79)$ \downarrow $264.9 = \frac{1}{2} \times 9.8 \times t^2 \Rightarrow t \approx 7.35$ avrt $CN = 20 \times 7.35 \approx 147$ avrt $OC = 140$ (m) accept 136</p>	<p>BI, BI MI AI <u>4</u> MI AI <u>2</u> BI MI AI <u>3</u> MI MI AI MI AI AI <u>6</u> (15)</p>