Marking Scheme

Combined Mathematics II

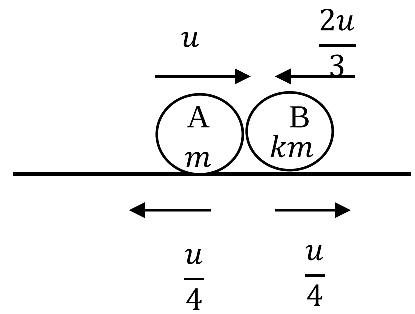
Grade 13 – Third term Test - 2026

PART A

01.

By conservation of linear momentum $\rightarrow$

$$mu - \frac{2kmu}{3} = -\frac{mu}{4} + \frac{kmu}{4}$$ 10



$$\frac{3-2k}{3} = \frac{-1+k}{4}$$

$$12 - 8k = -3 + 3k$$

$$k = \frac{15}{11}$$ 05

By newton's law of restitution

$$e = \frac{\frac{u}{2}}{\frac{5u}{3}}$$ 05 $\quad \therefore e = \frac{3}{10}$ 05

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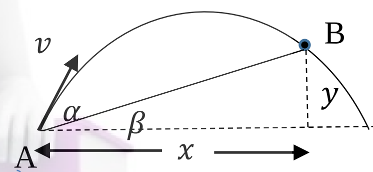
02.

Applying $s = ut$ $\rightarrow$

$x = v\cos\alpha T$ ………….. (1) 05

Applying $s = ut + \frac{1}{2}at^2$ $\uparrow$

$y = v\sin\alpha T - \frac{1}{2}gT^2$ ………… (2) 05



Since $\tan\beta = \frac{y}{x}$, $\quad \tan\beta = \frac{v\sin\alpha T - \frac{1}{2}gT^2}{v\cos\alpha T}$ 05

$$\tan\beta = \tan\alpha - \frac{gT}{2v\cos\alpha}$$

$$\frac{gT}{2v\cos\alpha} = \frac{\sin(\alpha-\beta)}{\cos\alpha\cos\beta}$$ 05

$$v = \frac{gT\cos\beta}{2\sin(\alpha-\beta)}$$ 05

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03.

Considering the length of the string

$3x + y = l$ 05

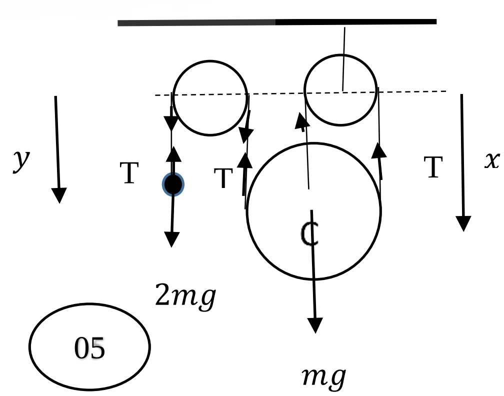
$3\ddot{x} + \ddot{y} = 0$ …………. (1)

Applying $F = ma$ for pulley C $\downarrow$ 10

$mg - 3T = m\ddot{x}$ …………. (2)

Applying $F = ma$ for the particle $\downarrow$ 05

$2mg - T = 2m\ddot{y}$ ……….. (3)



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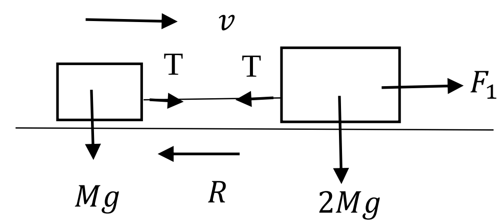
04. Applying $P = Fv$ for 1st case

$\frac{2H}{3} = F_1 v$ .... (1) $\therefore\ F_1 = \frac{2H}{3v}$ 05



Applying $\overrightarrow{F = ma}$ for the system for 1st case

$\frac{2H}{3v} - R = (3M)\frac{a}{2}$ .... (2)

$\therefore R = \frac{2H}{3v} - 3M\frac{a}{2}$ .... (a) 05

Applying $P = Fv$ for 2st case

$H = F_2 v$ .... (3) 05

Applying $F = ma$ for the system for 2st case

$\frac{H}{v} - R = 3Ma$ .... (4)

$\therefore R = \frac{H}{v} - 3Ma$ .... (b) 05

Since (a) = (b)

$\frac{2H}{3v} - 3M\frac{a}{2} = \frac{H}{v} - 3Ma$

$4H - 9Mav = 6H - 18Mav$

$9Mav = 2H$

$a = \frac{2H}{9Mv}$ 05

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05. $m^2 + n^2 = 5$ .... (1) 05

$(2\underline{i} + \underline{j}).\underline{i} = \sqrt{5}\,cos\theta \longrightarrow \therefore cos\theta = \frac{2}{\sqrt{5}}$

$(2\underline{i} + \underline{j}).(m\underline{i} + n\underline{j}) = \sqrt{5}\sqrt{5}\,cos2\theta$

$2m + n = 5\left(2 \times \frac{4}{5} - 1\right) \longrightarrow \therefore 2m + n = 3$ .... (2) 10

$m^2 + (3 - 2m)^2 = 5 \longrightarrow \therefore 5m^2 - 12m + 4 = 0$

$\therefore m = \frac{2}{5}\quad or\ \ m = 2$

$\therefore n = \frac{11}{5}\quad or\ n = -1$

$since\ n < 0,\ \ m = 2\ and\ n = -1$ 10

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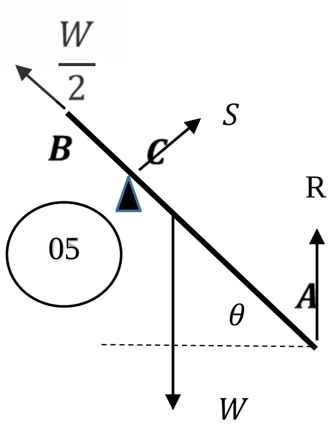
06. Taking moments for the rod about A clockwise

$S \times 4a - Wcos\theta \times 3a = 0$

$S = \frac{\sqrt{5}W}{4}$ 10



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Resolving for the rod along the rod upward

$Rsin\theta + \frac{W}{2} - Wsin\theta = 0$

$R \times \frac{2}{3} + \frac{W}{2} = W \times \frac{2}{3}$

$\therefore R = \frac{W}{4}$ 10

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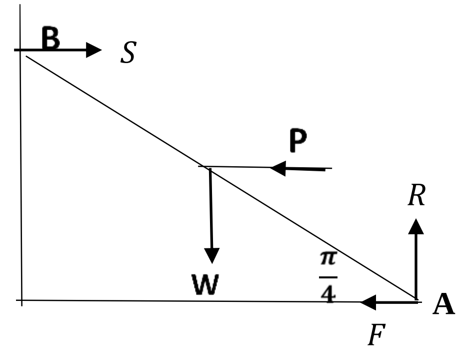
07. Taking moments for the rod about A clockwise



$S sin\frac{\pi}{4} \times 2a - P sin\frac{\pi}{4} \times a - W sin\frac{\pi}{4} \times a = 0$ 05

$\therefore S = \frac{W+P}{2}$

Resolving horizontally for the rod $\longrightarrow$

$S - P - F = 0 \longrightarrow \therefore F = \frac{W-P}{2}$ 05

Resolving vertically for the rod $\uparrow$

$R = W$ 05

For static equllibrium $\left|\frac{F}{S}\right| \leq \mu$

$-\frac{1}{4} \leq \left(\frac{\frac{W-P}{2}}{W}\right) \leq \frac{1}{4} \longrightarrow \frac{-W}{2} \leq W - P \leq \frac{W}{2}$

When $-\frac{W}{2} \leq W - P \;\rightarrow\; P \leq \frac{3W}{2}$

When $W - P \leq \frac{W}{2} \;\rightarrow\; P \geq \frac{W}{2}$ 10

$\frac{W}{2} \leq P \leq \frac{3W}{2}$

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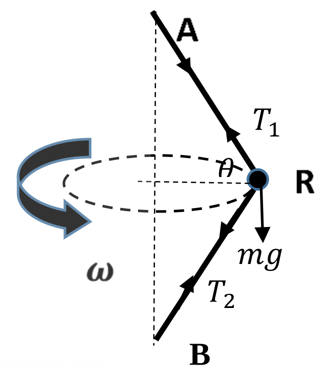
08. $sin\theta = \frac{a}{\left(\frac{3a}{2}\right)} = \frac{2}{3}$



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Resolving vertically upward for the particle

$T_1 sin\theta - T_2 sin\theta - mg = 0$ 05

$\therefore \; T_1 - T_2 = \frac{3mg}{2}$ …….. (1)

Applying $F = ma$ for the particle towards the centre

$T_1 cos\theta + T_2 cos\theta = m \times \frac{3a}{2}\, cos\theta \times \omega^2$ 05

$\therefore \; T_1 + T_2 = 6mg$ ……… (2)

(1) + (2) $2T_1 = \frac{15mg}{2} \;\rightarrow\; \therefore T_1 = \frac{15mg}{4}$ 05

(2) − (1) $2T_2 = \frac{9mg}{2} \;\rightarrow\; \therefore T_2 = \frac{9mg}{4}$ 05

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09. $since\ \ P(A) = 1 - P(A^{/})$

$P(A) = 0.3$ 05

$since\ P(A \cap B) = P(A) - P(B^{/} \cap A)$

$P(A \cap B) = 0.3 - 0.2 = 0.1$ 05

Since $P(A \cup B) = P(A) + P(B) - P(A \cap B)$

$P(A \cup B) = 0.3 + 0.4 - 0.1 = 0.6$

05

$$P(B/A \cup B) = \frac{P\big(B \cap (A \cup B)\big)}{P(A \cup B)}$$

$$P(B/A \cup B) = \frac{P\big((B \cap A) \cup (B \cap B)\big)}{P(A \cup B)}$$

$$P(B/A \cup B) = \frac{P(B)}{P(A \cup B)} = \frac{0.4}{0.6} = \frac{2}{3}$$

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10. Since $\overline{x} = \frac{\sum x_i}{n}$

$\sum x_i = n\overline{x}$

$\therefore sum\ of\ incorrect\ data = 10 \times 40 = 400$

$sum\ of\ correct\ data = 400 - 85 + 65 = 380$

$\therefore correct\ mean = \frac{380}{10} = 38$ 10

$Since\ , variance\ \ S^2 = \frac{\sum {x_i}^2}{n} - \overline{x}^2$

$\sum {x_i}^2 = n\big(S^2 + \overline{x}^2\big)$

$sum\ of\ squares\ of\ incorrect\ data = 10(144 + 1600) = 17440$

$sum\ of\ squares\ of\ correct\ data = 17440 - 85^2 + 65^2 = 14440$

$correct\ variance = \frac{14440}{10} - \ 38^2 = 0$ 15

$corrrect\ standard\ deviation = 0$

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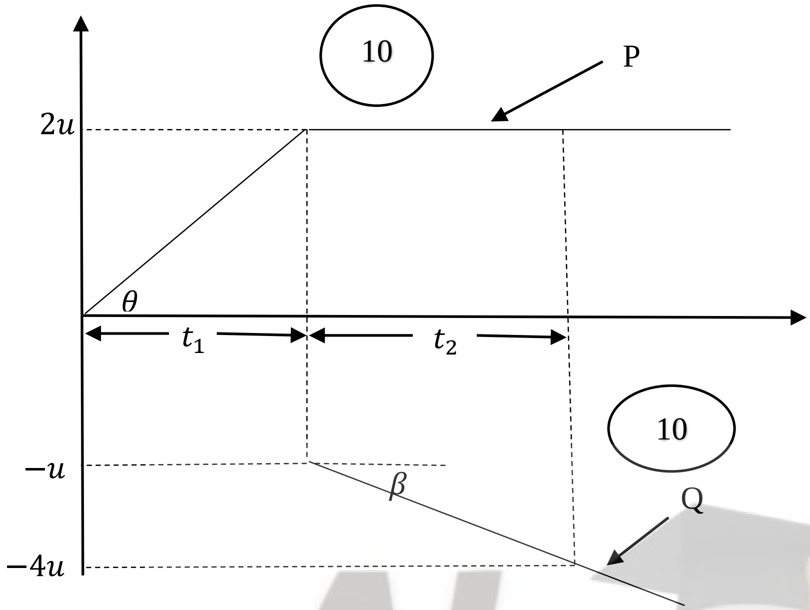
PART B

(11)



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$tan\theta = a$

$(i) tan\theta = \dfrac{2u}{t_1} = a$ 10

$\therefore \; t_1 = \frac{2u}{a}$

(ii) *Distance travelled by P + distance tavelled by Q = k*

$\frac{1}{2} \times \frac{2u}{a} \times 2u + 2u \times t_2 + \left(\frac{4u+u}{2}\right) t_2 = k \quad \rightarrow \quad 4u^2 + 4aut_2 + 5aut_2 = 2ak$

$t_2 = \frac{2k}{9u} - \frac{4u}{9a}$ 30

$(iii) tan\beta = \dfrac{3u}{\left(\frac{2k}{9u} - \frac{4u}{9a}\right)} = \dfrac{27au^2}{2ka - 4u^2}$ 10

70

$V_{W,E} = \overrightarrow{u}$

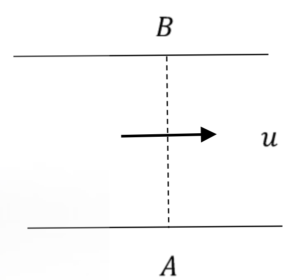
$V_{P,W} = v \quad , \quad V_{Q,W} = 2v \,, \quad V_{P,E} = \uparrow \qquad , V_{Q,E} = \downarrow$

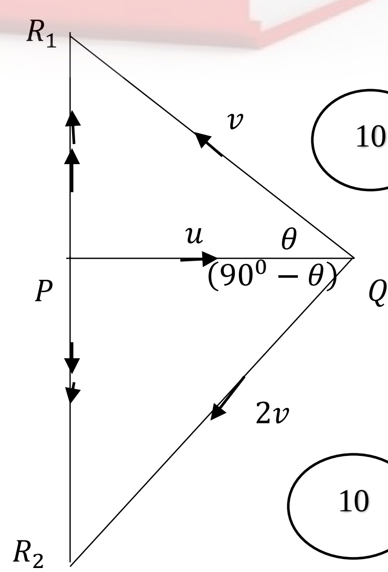
$V_{P,E} = V_{P,W} + V_{W,E}$

$\overrightarrow{PR_1} = \overrightarrow{PQ} + \overrightarrow{QR_1}$ 20

$V_{Q,E} = V_{Q,W} + V_{W,E}$

$\overrightarrow{PR_2} = \overrightarrow{PQ} + \overrightarrow{QR_2}$





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$u = v\cos\theta \quad \rightarrow \quad \cos\theta = \frac{u}{v}$

$u = 2v\cos(90^0 - \theta) \quad \rightarrow \quad \sin\theta = \frac{u}{2v}$

$since \ \left(\frac{u}{v}\right)^2 + \left(\frac{u}{2v}\right)^2 = 1$

$5u^2 = 4v^2$

$v = \frac{\sqrt{5}u}{2}$ 20

$\overrightarrow{PR_1} = \frac{u}{2} \qquad \overrightarrow{PR_2} = 2u$

$S_1 = \frac{u}{2}t \qquad S_2 = 2ut$

Since $S_1 + S_2 = a$

$t = \frac{2a}{5u}$ 20

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150

(12) Apply $\underline{F} = m\underline{a}$ 15

For the system $\longrightarrow$

$T_1 = Ma_3 + m(a_3 + a_1\cos\alpha)$ .... (1)

For P $\nearrow$ 10

$T_1 - mg\sin\alpha = m(a_1 + a_3\cos\alpha)$ .... (2)

For R $\downarrow$ 10

$mg + 2T_2 - T_1 = ma_4$......... (3)

For S $\downarrow$

$2mg - T_2 = 2m(a_3 + a_4)$ .... (4) 10

For T $\uparrow$

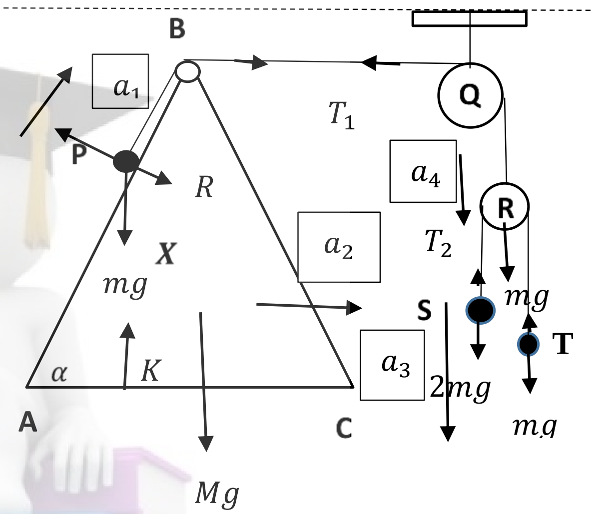
$T_2 - mg = m(a_3 - a_4)$ .... (5) 10

Considering the length of the string

$\ddot{x} + \ddot{y} + \ddot{Z} = 0$

$-a_1 - a_3 + a_4 = 0$ 10

$a_4 = a_1 + a_3$ .... (6) 90



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Forces and accelerations

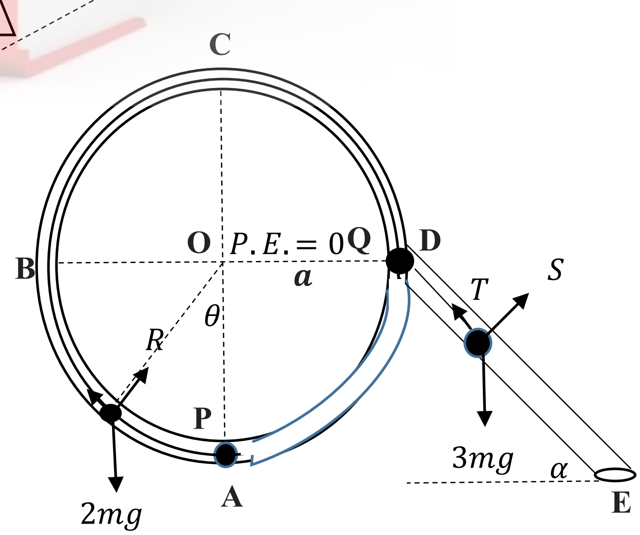
(b) By conservation of energy

$-2mga = -2mga\cos\theta + \frac{1}{2}2mv^2$

$-3mga\theta\sin\alpha + \frac{1}{2}3mv^2$ 25

$5v^2 = 4ag\cos\theta - 4ag + 6ag\theta\sin\alpha$

$a\dot{\theta}^2 = \frac{2g}{5}(2\cos\theta + 3\theta\sin\alpha - 2)$ 10



Applying $F = ma$ towards the centre for P $\nearrow$

$$R - 2mg\cos\theta = 2m \times \frac{2g}{5}(2\cos\theta + 3\theta\sin\alpha - 2)$$ 20

$$R = \frac{2mg}{5}(9\cos\theta + 6\theta\sin\alpha - 4)$$ 05

60

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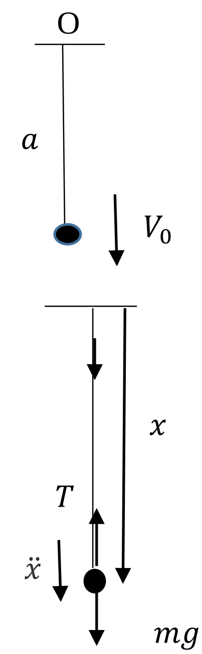
(13) Applying $v^2 = u^2 + 2as \downarrow$

$v_0{}^2 = 2ag + 2ag$ 10

$v_0 = 2\sqrt{ag}$



Applying $F = ma \downarrow$

$mg - T = m\ddot{x}$ 15

$$mg - \frac{kmg(x-a)}{a} = m\ddot{x}$$ 10

$\ddot{x} + \frac{kg}{a}\left(x - a - \frac{a}{k} = 0\right)$, where $\omega = \sqrt{\frac{kg}{a}}$ 05

When $\ddot{x} = 0$

$x = a + \frac{a}{k}$, So center lies at a distance $a + \frac{a}{k}$ from O. 05

Since $y = x - \left(a + \frac{a}{k}\right)$

$\ddot{y} = \ddot{x}$ $\quad \therefore \ddot{y} = \omega^2 y$ 10

55

Since $y = -\frac{a}{k}$, $\dot{y} = 2\sqrt{ag}$ and $\dot{y}^2 = \omega^2(A^2 - y^2)$

$4ag = \frac{kg}{a}\left(A^2 - \frac{a^2}{k^2}\right) \longrightarrow A = \frac{a}{k}\sqrt{4k+1}$ 20

maximum downward displacement = $a + \frac{a}{k} + \frac{a}{k}\sqrt{4k+1}$ 05

maximum tension in the string = $\frac{kmg}{a}\left(\frac{a}{k} + \frac{a}{k}\sqrt{4k+1}\right)$

tension in the string when the particle is at the centre = $\frac{kmg}{a}\left(\frac{a}{k}\right)$ 15

Ratio = $\left(1 + \sqrt{1+4k}\right) : 1$

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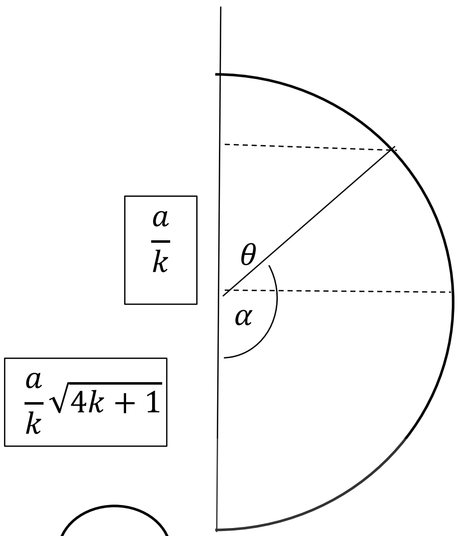

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$$\cos\theta = \frac{\frac{a}{k}}{\frac{a}{k}\sqrt{4k+1}} = \frac{1}{\sqrt{4k+1}}$$

$$\theta = \cos^{-1}\left(\frac{1}{\sqrt{4k+1}}\right)$$

15

$$\alpha = \pi - \cos^{-1}\left(\frac{1}{\sqrt{4k+1}}\right)$$

Time taken for the SHM = $\sqrt{\frac{a}{kg}}\left(\pi - \cos^{-1}\left(\frac{1}{\sqrt{4k+1}}\right)\right)$

Time for the motion under gravity

$v = u + at$

10

$2\sqrt{ag} = \sqrt{2ag} + gt \longrightarrow t = \sqrt{\frac{a}{g}}\left(2-\sqrt{2}\right)$

$\therefore Total\ time = \left\{2\sqrt{k} - \sqrt{2k} + \pi - \cos^{-1}\frac{1}{\sqrt{1+4k}}\right\}\sqrt{\frac{a}{kg}}$ 10 40

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time taken to come to instantaneous rest from centre = $\frac{\frac{\pi}{2}}{\sqrt{\frac{kg}{a}}} = \frac{\pi}{2}\sqrt{\frac{a}{kg}}$

since $\frac{\pi}{2}\sqrt{\frac{a}{kg}} = \frac{\pi}{2}\sqrt{\frac{a}{g}} \longrightarrow \therefore k = 1$ 15

maximum speed of the motion = $\omega A = \sqrt{\frac{kg}{a}} \times \frac{a}{k}\sqrt{4k+1} = \sqrt{\frac{g}{a}} \times \sqrt{5}a = \sqrt{5ag}$ 15 150

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(14)

$\overrightarrow{OA} = \underline{a}$, $\overrightarrow{OB} = \underline{b}$, $\overrightarrow{OC} = \underline{a} + \frac{1}{3}\underline{b}$, $\overrightarrow{OD} = 3\underline{a} + \frac{2}{3}\underline{b}$, $\overrightarrow{OE} = -(7\underline{a} + \underline{b})$

$\overrightarrow{CD} = 3\underline{a} + \frac{2}{3}\underline{b} - \underline{a} - \frac{1}{3}\underline{b} = 2\underline{a} + \frac{1}{3}\underline{b}$ 15

$\overrightarrow{CE} = -7\underline{a} - \underline{b} - \underline{a} - \frac{1}{3}\underline{b} = -8\underline{a} - \frac{4}{3}\underline{b}$ 10

$\therefore\ \overrightarrow{EC} = 4\overrightarrow{CD}\ \therefore\ C, D, E$ are collinear $\quad \therefore EC : CD = 4 : 1$ 10 35

Since $\overrightarrow{AG} = \lambda\overrightarrow{AB}$

$\overrightarrow{AG} = \lambda(\underline{b} - \underline{a})$

05

Since $\overrightarrow{EG} = \mu\overrightarrow{ED}$

$\overrightarrow{EG} = \mu\left(3\underline{a} + \frac{2}{3}\underline{b} + 7\underline{a} + \underline{b}\right)$

$\overrightarrow{EG} = \mu\left(10\underline{a} + \frac{5}{3}\underline{b}\right)$

05

Since $\overrightarrow{AG} + \overrightarrow{GE} = \overrightarrow{AE}$

$$\lambda(\underline{b} - \underline{a}) - \mu\left(10\underline{a} + \tfrac{5}{3}\underline{b}\right) = -7\underline{a} - \underline{b} - \underline{a}$$ 10

$\underline{a}(-\lambda - 10\mu + 8) + \underline{b}\left(\lambda - \frac{5}{3}\mu + 1\right) = \underline{0}$, *since $\underline{a}$ and $\underline{b}$ are non parallel*

$\therefore \lambda + 10\mu = 8$ and $\frac{5}{3}\mu - \lambda = 1$ 10 $\longrightarrow$ $\therefore \lambda = \frac{2}{7}$ *and* $\mu = \frac{27}{35}$ 10

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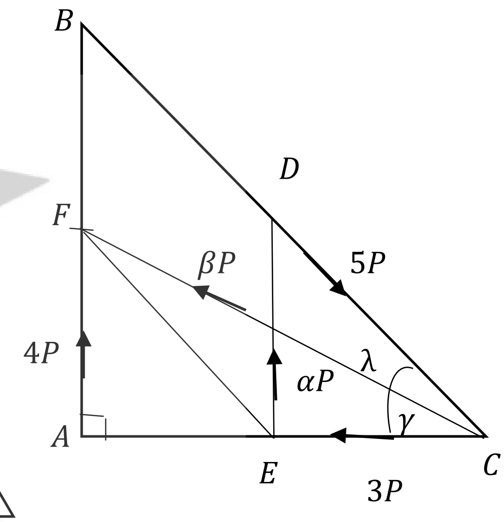
(b) $\quad tan\gamma = \dfrac{2}{3}$, $\quad tan\lambda = \dfrac{4}{3}$ 05



Taking moments about E anticlockwise

$$\beta P sin\gamma \times \frac{3}{2} - 5P sin\lambda \times \frac{3}{2} - 4P \times \frac{3}{2} = 0$$ 10

$\beta = 4\sqrt{13}$ 05

Taking moments about F anticlockwise

$$\alpha P \times \frac{3}{2} - 3P \times 2 - 5P cos\lambda \times 2 = 0$$ 05

$\alpha = 8$ 05

30

$\leftarrow$ $X = 3P + \beta P cos\gamma - 5P cos\lambda$ 15

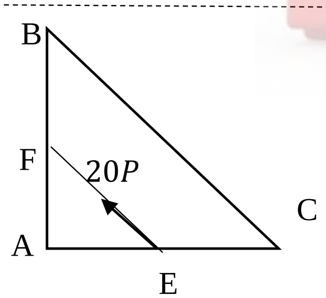
$$X = 3P + 4\sqrt{13} \times \frac{3}{\sqrt{13}} - 5P \times \frac{3}{5} = 12PN$$

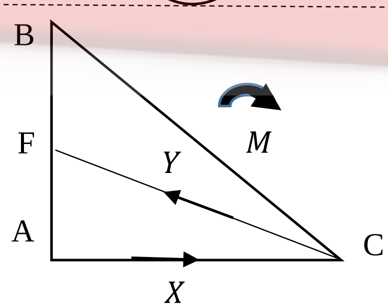
$\uparrow$ $Y = 4P + 8P - 5P sin\lambda + \beta P sin\gamma$ 10

$$Y = 4P + 8P - 5P \times \frac{4}{5} + 4\sqrt{16} \times \frac{2}{\sqrt{13}} = 16PN$$

$R = \sqrt{(12P)^2 + (16P)^2} = 20PN$ 05

30





Taking moments about C for both systems

$$M = 16P \times \frac{3}{2} = 24PNm$$ 05

Taking moments about E for both systems anticlockwise

$$Ysin\gamma \times \frac{3}{2} - 24P = 0$$ 05

$Y = 8\sqrt{13}P\ N$

15

Resolving horizontally for both systems

$12P = Ycos\gamma - X$

$$X = 8\sqrt{13}P \times \frac{3}{\sqrt{13}} - 12P$$ 05

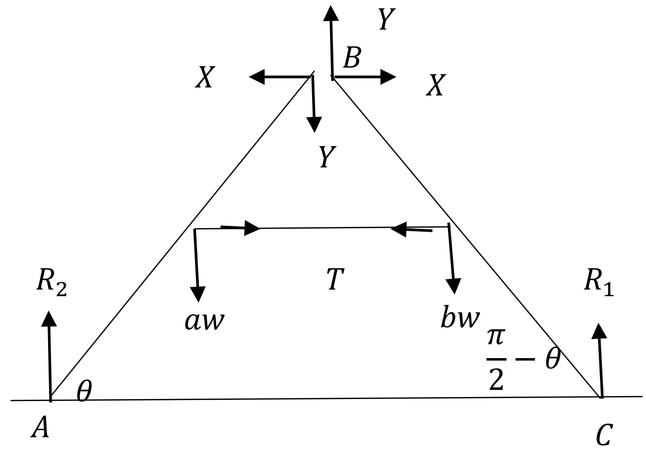
$X = 12PN$

150

(15)

$tan\theta = \frac{b}{a}$ 05

Taking moments about A for the whole system about A anticlockwise



$R_1(acos\theta + bsin\theta) = aw \times \frac{a}{2}cos\theta$ 15

$+bw \times \left(acos\theta + \frac{b}{2}sin\theta\right)$ ………… (2)

By (2) $R_1 = \dfrac{\frac{a^2w}{2}\times\frac{a}{\sqrt{a^2+b^2}} + baw\times\frac{a}{\sqrt{a^2+b^2}} + \frac{b^2w}{2}\times\frac{b}{\sqrt{a^2+b^2}}}{a\times\frac{a}{\sqrt{a^2+b^2}} + b\times\frac{b}{\sqrt{a^2+b^2}}}$ 10

$R_1 = \frac{a^3w+2a^2bw+b^3w}{2(a^2+b^2)} = \frac{W(a^3+2a^2b+b^3)}{2(a^2+b^2)}$ 30

Taking moments for the rod BC about B 10

$Tcos\theta \times \frac{b}{2} + bwsin\theta \times \frac{b}{2} - R_1 sin\theta \times b = 0$

$T = tan\theta\left(\frac{W(a^3 + 2a^2b + b^3)}{(a^2 + b^2)} - bw\right) = \frac{wab(a + b)}{a^2 + b^2}$ 05

15

Resolving horizontally for the rod BC

$X = \frac{wab(a + b)}{a^2 + b^2}$ 05

Resolving vertically for the rod BC

$Y = bw - R_1 = \frac{-wa^3}{2(a^2 + b^2)}$ 05

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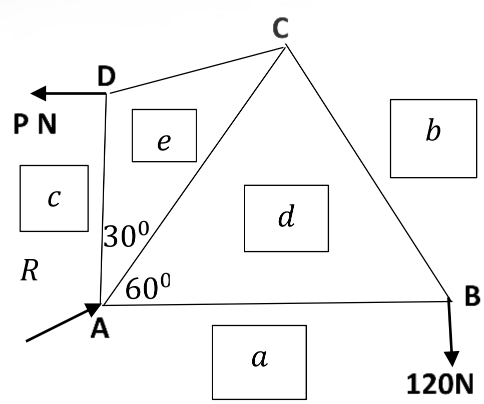
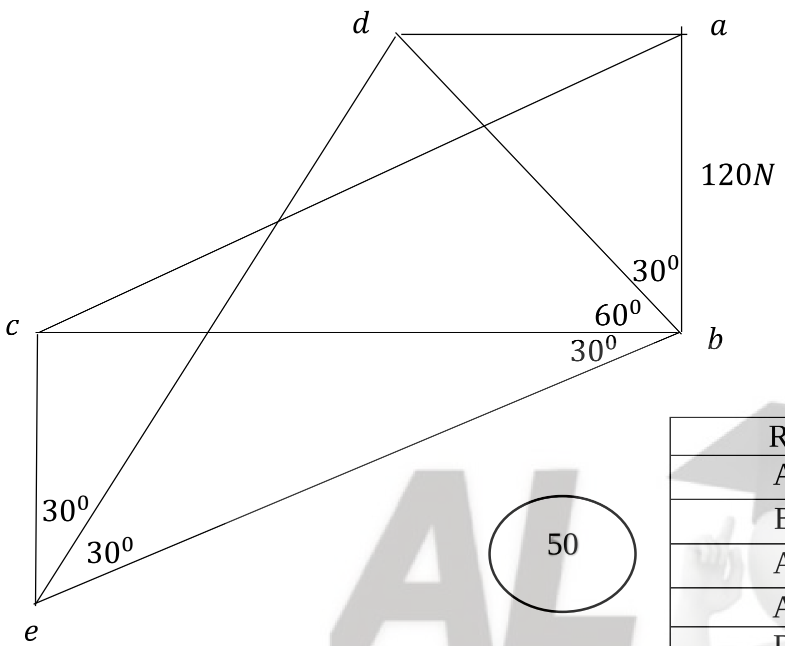
Taking moments about A anticlockwise for the framework



$P \times 2a = 120 \times 2\sqrt{3}a$

$P = 120\sqrt{3}N$

10

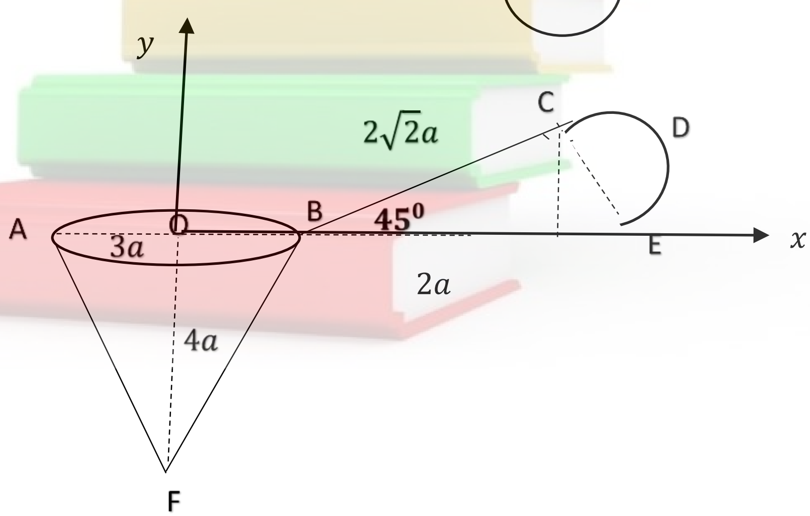


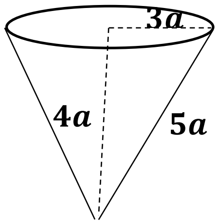
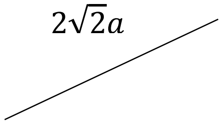
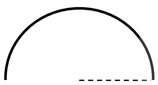
Rod	Magnitude(N)	Tension/Thrust
AB	$40\sqrt{3}$	Thrust
BC	$80\sqrt{3}$	Tension
AC	$160\sqrt{3}$	Thrust
AD	120	Tension
DC	240	Tension

$R = 240N$ 05 95 150

(16) (i) Theory of proof of centre of mass of a thin uniform semi-circular wire of radius a 30

(ii) Theory of proof of a thin uniform hollow cone of height h 30



object	mass	x	y
	$\pi(3a)(5a)\sigma$ $= 15\pi a^2\sigma$ $(\mathbf{15\pi k})$	0	$-\frac{1}{3}(4a)$ $= -\frac{4a}{3}$
	$2\sqrt{2}a \times \sqrt{2}a\sigma$ $= 4a^2\sigma$ $(\mathbf{4k})$	$\sqrt{2}a\cos\frac{\pi}{4} + 3a$ $= 4a$	$\sqrt{2}a\sin\frac{\pi}{4}$ $= a$
	$\sqrt{2}\pi a \times \sqrt{2}a\sigma$ $= 2\pi a^2\sigma$ $(2\pi k)$	$3a + 2a + \sqrt{2}a\sin\frac{\pi}{4}$ $+\frac{2\sqrt{2}a}{\pi}\cos\frac{\pi}{4}$ $= 6a + \frac{2a}{\pi}$	$2a - \sqrt{2}a\cos\frac{\pi}{4}$ $+\frac{2\sqrt{2}a}{\pi}\cos\frac{\pi}{4}$ $= a + \frac{2a}{\pi}$
Solid	$k(17\pi + 4)$	$\overline{x}$	$\overline{y}$

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$$k(17\pi + 4)\overline{x} = \mathbf{4k}(4a) + 2\pi k\left(6a + \frac{2a}{\pi}\right)$$

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$$\overline{x} = \frac{20a + 12\pi a}{17\pi + 4} = \left[\frac{4(5 + 3\pi)}{(17\pi + 4)}\right]a$$

$$k(17\pi + 4)\overline{y} = \mathbf{15\pi k}\left(-\frac{4a}{3}\right) + \mathbf{4k}(a) + 2\pi k\left(a + \frac{2a}{\pi}\right)$$

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$$\overline{y} = \frac{-18\pi a + 8a}{17\pi + 4} = -\frac{2a(9\pi - 4)}{17\pi + 4}$$

$$\tan\theta = \frac{\overline{x}}{(4a - \overline{y})}$$

$$\tan\theta = \frac{\left[\frac{4(5 + 3\pi)}{(17\pi + 4)}\right]a}{4a - \left(\frac{2a(9\pi - 4)}{17\pi + 4}\right)}$$

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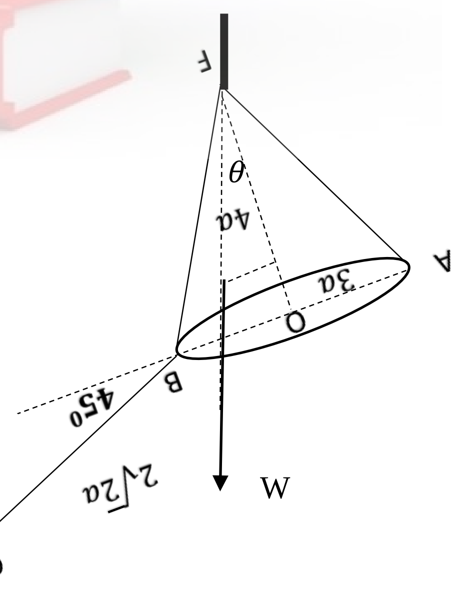
$$\theta = \tan^{-1}\left(\frac{2(5 + 3\pi)}{25\pi + 12}\right)$$



150

17. (i) If the event of second ball being white is A

White – 07

Black - 03

$$P(A) = P(W)P(W/W) + P(B)P(W/B)$$

$$\frac{11}{15} = \frac{7}{10} \times \frac{n+7}{n+11} + \frac{3}{10} \times \frac{7}{9}$$

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$$66(n+11) = 63(n+7) + 21(n+11)$$

White – $n+7$

Black - 04

$$45(n+11) = 63n + 441$$

$$18n = 495 - 441$$

$$n = 3$$

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(ii) If the event of third ball being black is B

$$P(B/A) = \frac{P(B\cap A)}{P(A)}$$

$$P(B\cap A) = P(W)P(W/W)P(B/W\cap W) + P(B)P(W/B)P(B/W\cap B)$$

$$P(B\cap A) = \frac{7}{10} \times \frac{10}{14} \times \frac{4}{13} + \frac{3}{10} \times \frac{7}{9} \times \frac{2}{8} = \frac{331}{1560}$$

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$$P(B/A) = \frac{331}{1560} \times \frac{15}{11} = \frac{331}{1144}$$

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(b)

Class interval	x_i	d_i	u_i	u_i^2	f_i	f_iu_i	$f_iu_i^2$
60-64	62	-10	-2	4	21	-42	84
65-69	67	-5	-1	1	27	-27	27
70–74	$72(A)$	0	0	0	28	0	0
75-79	77	5	1	1	14	14	14
80-84	82	10	2	4	06	12	24
85-89	87	15	3	9	04	12	36
					$\sum f_i = 100$	$\sum f_iu_i = -31$	$\sum f_iu_i^2 = 185$

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(i) Modal class = 69.5-74.5

$$M_0 = L_1 + c\left(\frac{\Delta_1}{\Delta_1+\Delta_2}\right) \qquad M_0 = 69.5 + 5\left(\frac{1}{1+14}\right) = 69.83$$

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(ii) Median class = 69.5-74.5

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$$M_e = L_1 + \frac{c}{f}\left(\frac{n}{2} - F_{m-1}\right) \qquad M_e = 69.5 + \frac{5}{28}(50-48) = 69.85$$

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(iii) Mean = $A + c\left(\frac{\sum f_iu_i}{\sum f_i}\right) = 72 + 5\left(\frac{-31}{100}\right) = 70.45$

95

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(iv) standard deviation = $\sqrt{c^2\left[\frac{\sum f_iu_i^2}{\sum f_i} - \left(\frac{\sum f_iu_i}{\sum f}\right)^2\right]} = \sqrt{25\left[\frac{185}{100} - \left(\frac{-31}{100}\right)^2\right]} = 6.62$

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(v) Coefficient of skewness = $\frac{Mean-Mode}{Standars\ deviation} = \frac{70.45-69.83}{6.62} = 0.092$

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