

පද්ධතියේ

$$\rightarrow I = \Delta mv$$

$$0 = (3mv_2 + 2mv_1) - (2m \times 7u - 3m \times 3u) \quad (10)$$

$$5u = 3v_2 + 2v_1 \rightarrow (1)$$

භි.ප.භ.

$$v_2 - v_1 = -e(-3u - 7u) \quad (5)$$

$$10eu = v_2 - v_1 \rightarrow (2)$$

$$(2) \times 2 + 1$$

$$5u(4e+1) = 5v_2$$

$$v_2 = u(4e+1) \quad (5)$$

$$3m \rightarrow I = \Delta mv$$

$$I = 3m(v_2 + 3u)$$

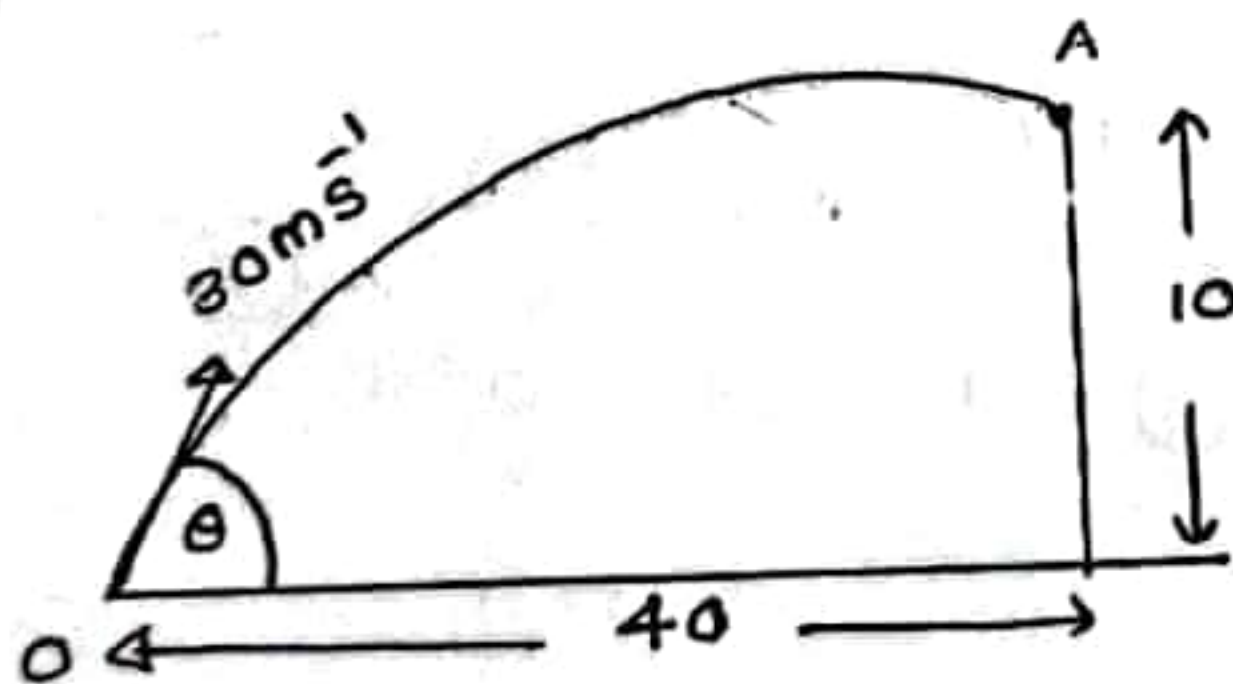
$$I = 3m(u(4e+1) + 3u)$$

$$= 3m(4u + 4eu)$$

$$= 12mu(1+e) \quad (5)$$

25

(2)



O සිට A ව

$$\rightarrow S = ut$$

$$40 = 30 \cos \theta \cdot t$$

$$t = \frac{4}{3 \cos \theta} \quad (5)$$

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

$$10 = 30 \sin \theta \cdot \frac{4}{3 \cos \theta} - \frac{1}{2} \times 10 \times \frac{16}{9 \cos^2 \theta} \quad (5)$$

$$1 = 4 \tan \theta - \frac{8}{9} (1 + \tan^2 \theta)$$

$$8 \tan^2 \theta - 36 \tan \theta + 17 = 0 \quad (5)$$

$$\Delta = (36)^2 - 4(8)(17) > 0$$

$\therefore$ ප්‍රක්ෂේපණය කෙරුණ දෘක්ෂණය වෙනස් වේ. 5

$$\tan \alpha + \tan \beta = \frac{36}{8}$$

$$\tan \alpha \cdot \tan \beta = 17/8$$

$$\tan(\alpha + \beta) = \frac{\tan \alpha + \tan \beta}{1 - \tan \alpha \tan \beta}$$

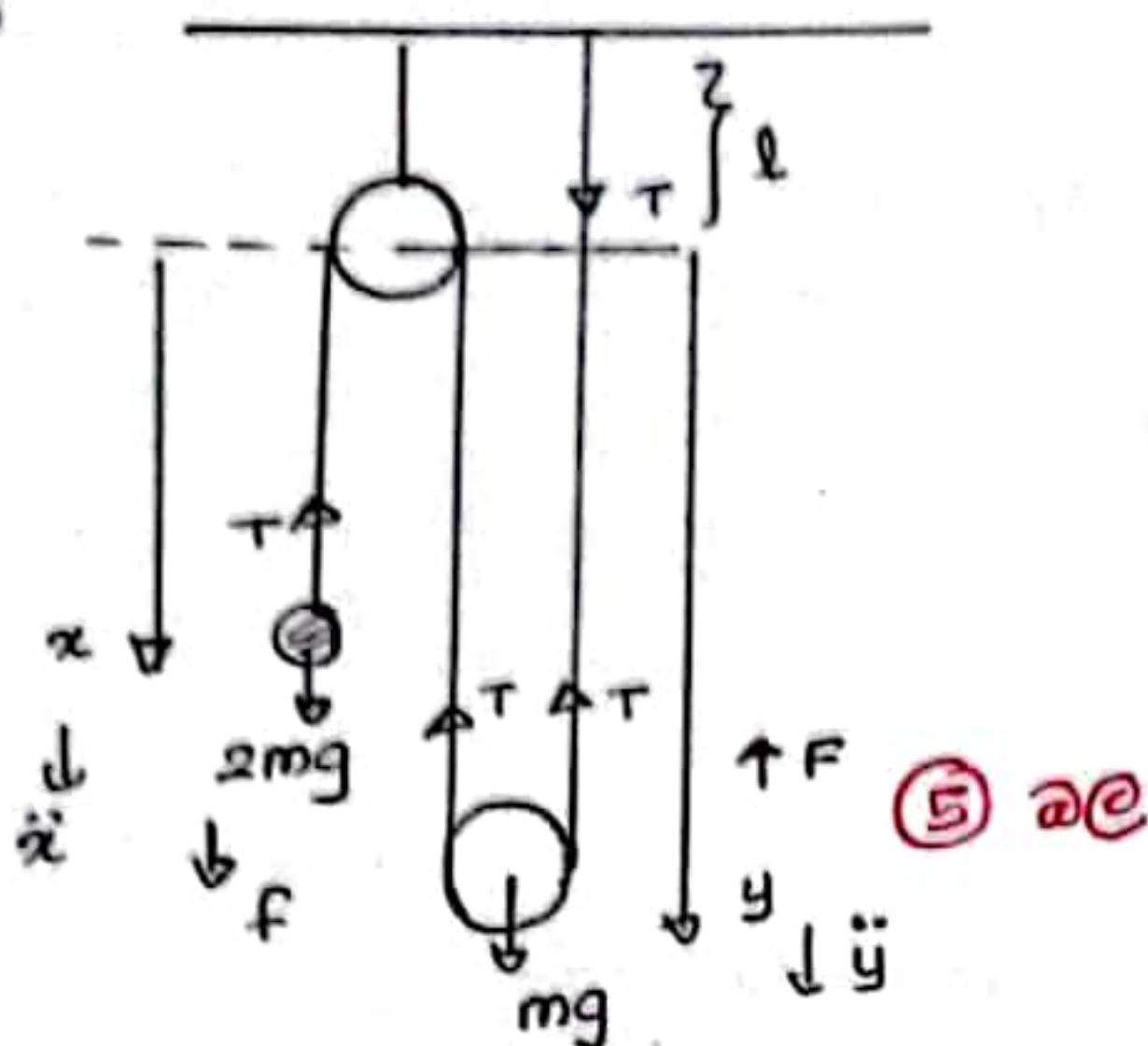
$$= \frac{36/8}{1 - 17/8}$$

$$= \frac{36}{8} \times \frac{(-8)}{9}$$

$$= -4 \quad (5)$$

25

(3)



$$x + 2y + l = k$$

$$\dot{x} + 2\dot{y} = 0$$

$$\ddot{x} + 2\ddot{y} = 0$$

$$\ddot{x} = -2\ddot{y}$$

$$f = 2F$$

(5)

(5) 20

$$2m/ \downarrow F = ma$$

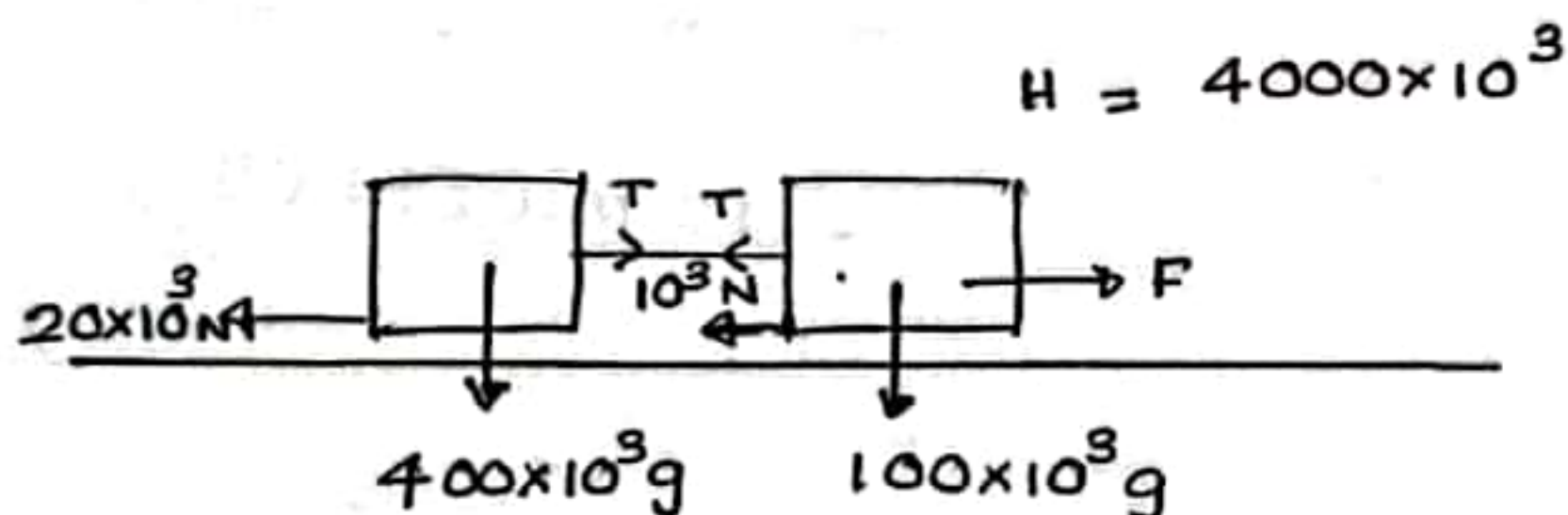
$$2mg - T = 2mf \quad (10)$$

$$m/ \uparrow F = ma$$

$$2T - mg = mF \quad (5)$$

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(4)



$$V = \frac{80 \times 1000}{3600}$$

$$V = \frac{200}{9} \text{ m s}^{-1}$$

පළමුවන

$$\rightarrow F = ma.$$

$$180 \times 10^3 - 20 \times 10^3 - 10^3 = (500 \times 10^3) a \quad (5) \quad F = 180 \times 10^3 \text{ N}$$

$$169 \times 10^3 = 500 \times 10^3 a$$

$$a = \frac{159}{500} \text{ m s}^{-2} \quad (5)$$

$$H = PV$$

$$4000 \times 10^3 = F \times \frac{200}{9} \quad (5)$$

ද්විතිය

$$\rightarrow F = ma$$

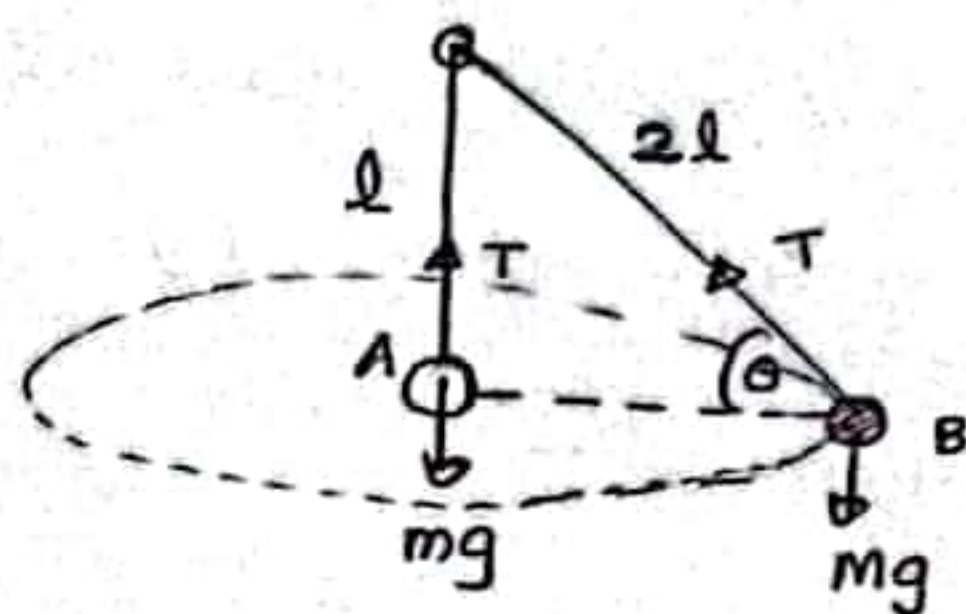
$$T - 20 \times 10^3 = 400 \times 10^3 \times \frac{159}{500} \quad (5)$$

$$T = 20 \times 10^3 + 127200$$

$$T = 147200 \text{ N} \quad (5)$$

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(5)



$$\sin \theta = l/2l$$

$$\theta = \pi/6$$

$$B/ \uparrow F = ma$$

$$T \sin \theta = mg \quad (5)$$

$$T \sin \pi/6 = Mg$$

$$T = 2Mg \quad (5)$$

$$A/ \uparrow T = mg$$

$$2mg = mg$$

$$m = 2M \quad (5)$$

$$B/ \leftarrow F = ma$$

$$T \cos \pi/6 = m \cdot 2l \cos \pi/6 \cdot \omega^2 \quad (5)$$

$$2Mg \times \frac{\sqrt{3}}{2} = 2Ml \times \frac{\sqrt{3}}{2} \omega^2$$

$$\omega^2 = \frac{g}{l}$$

$$\omega = \sqrt{\frac{g}{l}} \quad (5)$$

25

(6) $\underline{a} \perp \underline{b}$ then

$$\underline{a} \cdot \underline{b} = 0$$

$$(2\hat{i} + p\hat{j}) (2\hat{i} - 5\hat{j}) = 0 \quad (5)$$

$$4 - 5p = 0 \quad (5)$$

$$p = \frac{4}{5}$$

$$\underline{b} - \underline{a} = (2\hat{i} - 5\hat{j}) - (2\hat{i} + \frac{4}{5}\hat{j})$$

$$= -\frac{29}{5}\hat{j} \quad (5)$$

$$\underline{a} \cdot (\underline{b} - \underline{a}) = |\underline{a}| |\underline{b} - \underline{a}| \cos \theta$$

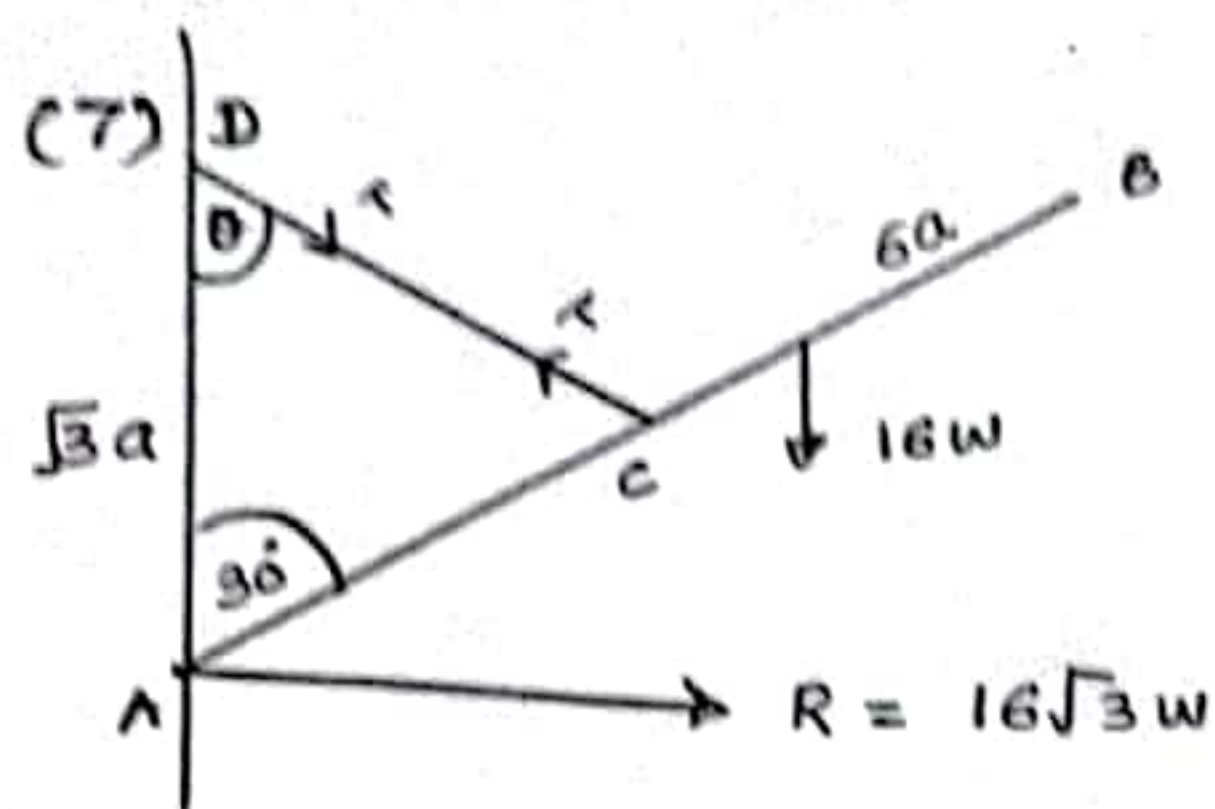
$$(2\hat{i} + \frac{4}{5}\hat{j}) (-\frac{29}{5}\hat{j}) = \frac{\sqrt{116}}{5} \times \frac{29}{5} \cos \theta \quad (5)$$

$$-\frac{4 \times 29}{5 \times 5} = \frac{\sqrt{116} \times 29}{5 \times 5} \cos \theta$$

$$\cos \theta = -\frac{4}{\sqrt{116}}$$

$$\theta = \cos^{-1} \left(-\frac{4}{\sqrt{116}} \right) \quad (5)$$

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බල විභේදනය

$$\uparrow T \cos \theta = 16w \rightarrow (1) \quad (5)$$

$$\leftarrow T \sin \theta = 16\sqrt{3}w \rightarrow (2) \quad (5)$$

$$\frac{(2)}{(1)} \quad \tan \theta = \sqrt{3}$$

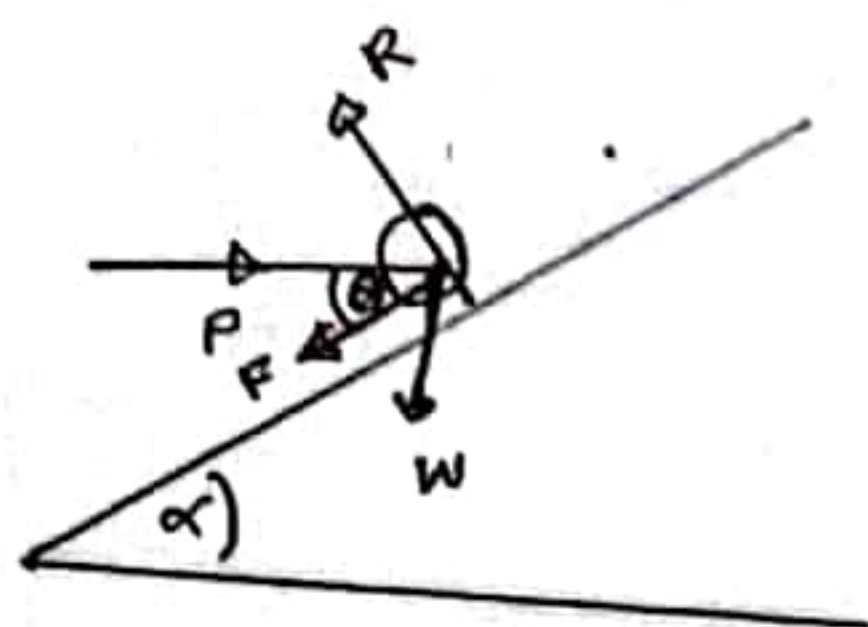
$$\theta = \pi/3 \quad (5)$$

$$\widehat{ACD} = \frac{\pi}{2}$$

$$AC = \sqrt{3}a \cos 30^\circ = \sqrt{3}a \times \frac{\sqrt{3}}{2} = \frac{3a}{2} \quad (10)$$

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(8)



බල විභේදනය

$$\rightarrow P \cos \theta = F + W \sin \theta \quad (5)$$

$$F = P \cos \theta - W \sin \theta \rightarrow (1)$$

$$\uparrow R = P \sin \theta + W \cos \theta \rightarrow (2) \quad (5)$$

සමතුලිතතාවයේ ඉවතිම

$$\mu \geq \frac{|F|}{R}$$

$$\mu \geq \frac{|P \cos \theta - W \sin \theta|}{P \sin \theta + W \cos \theta} \quad (5)$$

$$-\mu (P \sin \theta + W \cos \theta) \leq P \cos \theta - W \sin \theta \leq \mu (P \sin \theta + W \cos \theta)$$

$$W (\sin \theta - \mu \cos \theta) \leq P (\cos \theta + \mu \sin \theta)$$

$$\frac{W (\sin \theta - \mu \cos \theta)}{\cos \theta + \mu \sin \theta} \leq P \rightarrow (1) \quad (5)$$

$$P \cos \theta - W \sin \theta \leq \mu (P \sin \theta + W \cos \theta)$$

$$P (\cos \theta - \mu \sin \theta) \leq W (\mu \cos \theta + \sin \theta)$$

$$P \leq \frac{W (\mu \cos \theta + \sin \theta)}{\cos \theta - \mu \sin \theta} \rightarrow (2)$$

① හා ② ඒ

$$\frac{W (\sin \theta - \mu \cos \theta)}{\cos \theta + \mu \sin \theta} \leq P \leq$$

$$\frac{W (\mu \cos \theta + \sin \theta)}{\cos \theta - \mu \sin \theta} \quad (5)$$

25

$$(9) \quad P(B|A) = \frac{P(A \cap B)}{P(A)}$$

$$\frac{1}{4} \times P(A) = P(A \cap B) \Rightarrow P(A \cap B) = \frac{P}{4} \quad (8)$$

$$P(A \cup B) = P(A) + P(B) - P(A \cap B) \quad (5)$$

$$\frac{5P}{4} = P + P(B) - \frac{P}{4}$$

$$P(B) = \frac{P}{2} \quad (5)$$

$$P(A \cap B) = P(A) \cdot P(B) \quad (5)$$

$$\frac{P}{4} = P \cdot \frac{P}{2}$$

$$P = \frac{1}{2} \quad (5) \quad (P \neq 0)$$

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$$(10) \quad \bar{x} = \frac{\sum_{i=1}^n x_i}{n}$$

$$3.2 \times 10 = \frac{\sum_{i=1}^{10} x_i}{10}$$

$$\sum_{i=1}^{10} x_i = 32$$

$$\sum_{i=1}^9 x_i = 3 \times 9 = 27 \quad (5)$$

$$x_{10} = 32 - 27$$

$$\underline{x_{10} = 5} \quad (5)$$

$$\sigma_1^2 = \frac{\sum_{i=1}^9 x_i^2}{9} - (\bar{x}_1)^2$$

$$= \frac{81.9}{9} - (3)^2$$

$$= 9.1 - 9$$

$$= 0.1 \quad (5)$$

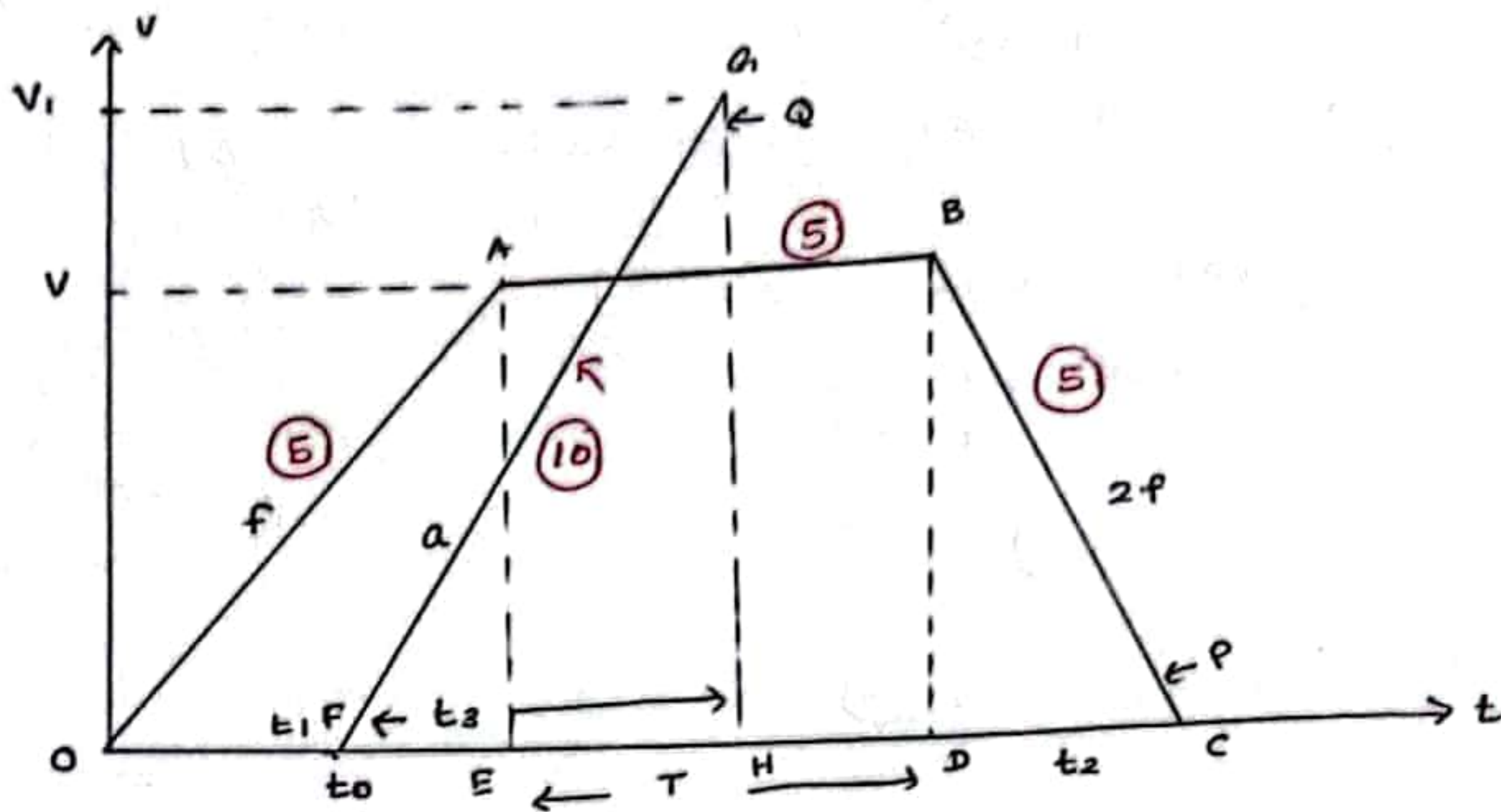
$$\sigma^2 = \frac{\sum_{i=1}^n x_i^2}{n} - (\bar{x})^2$$

$$\sum_{i=1}^{10} x_i^2 = 10 \times 0.45 + 10(3.2)^2 \quad (5)$$

$$\sum_{i=1}^9 x_i^2 = 4.5 + 102.4 = 106.9$$

$$\sum_{i=1}^{10} x_i^2 = 81.9 \quad (5)$$

(11)

OAE Δ ,

$$f = \frac{v}{t_1}$$

$$t_1 = \frac{v}{f} \quad (5)$$

BCD Δ

$$2f = \frac{v}{t_2}$$

$$t_2 = \frac{v}{2f} \quad (5)$$

OABC Δ $\therefore d =$

$$\frac{1}{2} \times (T + T + \frac{v}{f} + \frac{v}{2f}) \times v = d \quad (5)$$

$$2T + \frac{3v}{2f} = \frac{2d}{v}$$

$$T = \frac{d}{v} - \frac{3v}{4f} \quad (5)$$

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FGH Δ FGH Δ $\therefore d =$

$$a = \frac{v_1}{t_3}$$

$$t_3 = \frac{v_1}{a} \quad (5)$$

$$\frac{1}{2} \times t_3 \times v_1 = D \quad (5)$$

$$\frac{1}{2} \times \frac{v_1}{a} \times v_1 = D$$

$$v_1^2 = 2aD$$

$$v_1 = \sqrt{2aD}$$

$$t_3 = \sqrt{\frac{2D}{a}} \quad (5)$$

 $t_0 + t_3$ Δ $\therefore d =$

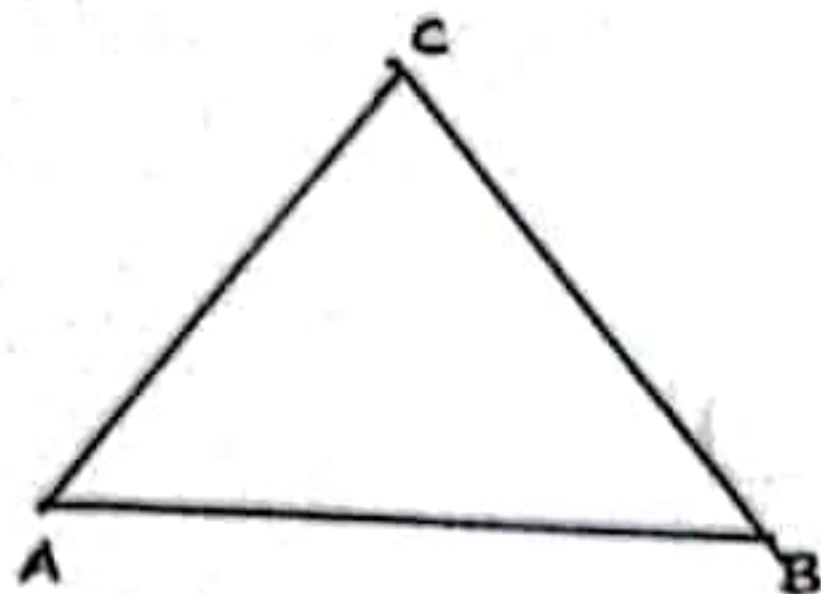
$$D = \frac{1}{2} \times t_1 \times v + v(t_3 - (t_1 - t_0)) \quad (5)$$

$$D = \frac{1}{2} \frac{v^2}{f} + v \cdot \sqrt{\frac{2D}{a}} - \frac{v^2}{f} + vt_0 \quad (5)$$

$$D = v \cdot \sqrt{\frac{2D}{a}} - \frac{v^2}{2f} + vt_0$$

$$t_0 = \frac{D}{v} + \frac{v}{2f} - \sqrt{\frac{2D}{a}} \quad (5)$$

(b)



$$\underline{v} (C, B) = u$$

$$\underline{v} (B, E) = \rightarrow v$$

$$\underline{v} (C, E) = \underline{v} (C, B) + \underline{v} (B, E) \quad (5)$$

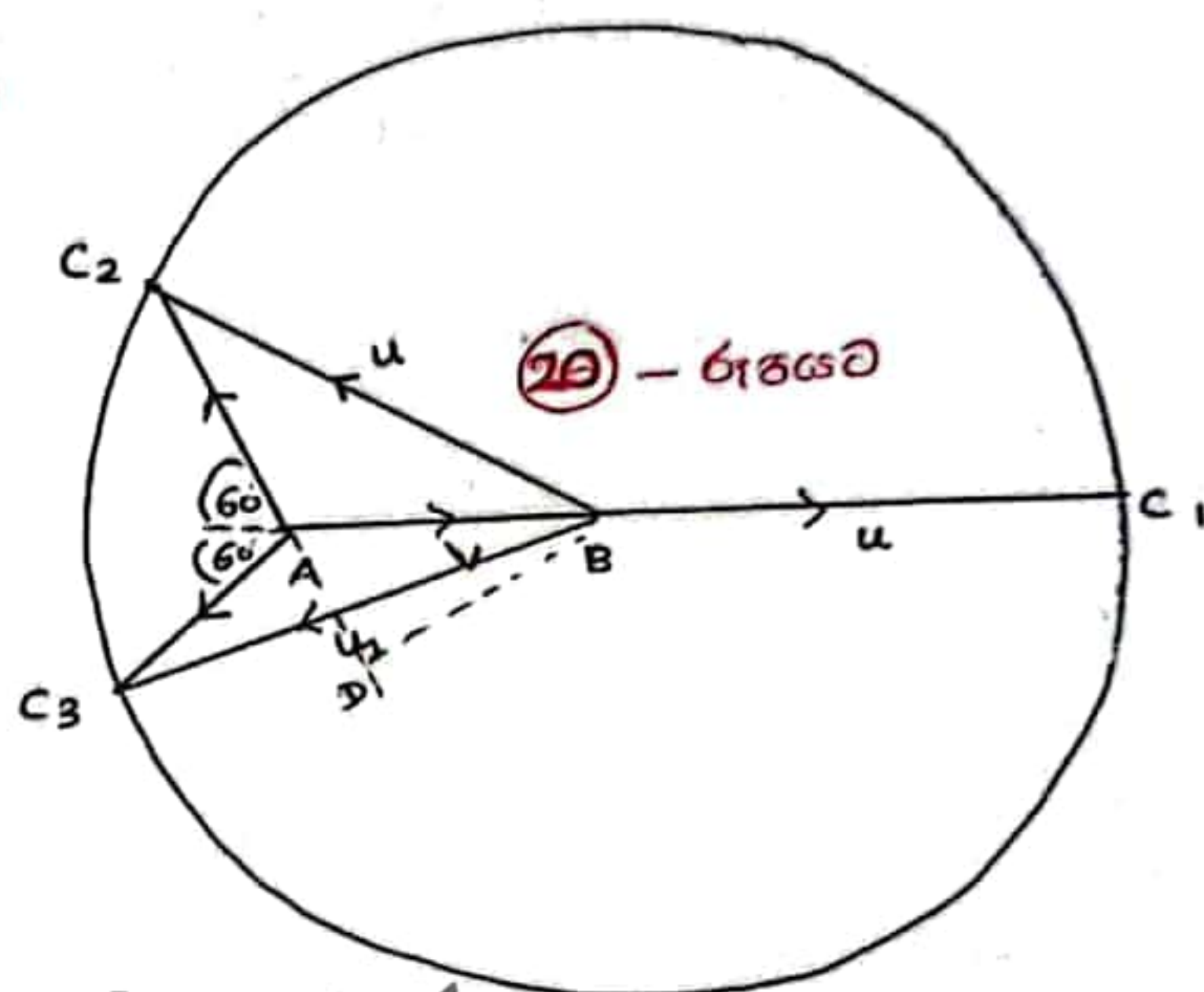
$$\rightarrow = u + \rightarrow v \quad (5)$$



$$\rightarrow = \rightarrow v + u$$



$$\overrightarrow{AC}_{1,2,3} = \overrightarrow{AB} + \overrightarrow{BC}_{1,2,3}$$



$$AC_1 = u + v \quad (5)$$

$$AC_2 = \sqrt{u^2 - v^2 \sin^2 60^\circ} + v \cos 60^\circ \quad (5)$$

$$AC_2 = \frac{1}{2} (\sqrt{4u^2 - 3v^2} - v)$$

$$= \frac{1}{2} (\sqrt{4u^2 - 3v^2} - v)$$

$$AC_2 = AC_3$$

$$= \frac{1}{2} \left[\sqrt{4 - 3 \frac{v^2}{u^2}} - \frac{v}{u} \right] \times u$$

$$= \frac{1}{2} \left[-\beta + \sqrt{4 - 3\beta^2} \right] u \quad (5)$$

$$t = \frac{a}{AC_1} + \frac{a}{AC_2} + \frac{a}{AC_3} \quad (5)$$

$$= \frac{a}{u+v} + \frac{2a}{\frac{1}{2} (\sqrt{4u^2 - 3v^2} - v)}$$

$$= \frac{a}{(1+\beta)u} \quad (5) + \frac{4a}{(-\beta + \sqrt{4 - 3\beta^2})u} \quad (5)$$

$$t = \frac{a}{u(1+\beta)} + \frac{\frac{4a}{u} \sqrt{4-3\beta^2} + \beta}{4(1-\beta^2)}$$

$$t = \frac{a}{u} \frac{\sqrt{4-3\beta^2} + \beta}{(1-\beta^2)} + \frac{a}{u(1+\beta)} \quad (5)$$

ആകെ അളവ് $\beta = \frac{v}{c}$, $T = \frac{3a}{u} \quad (5)$

$$t = \frac{T}{3} \left[\frac{1 + \sqrt{4-3\beta^2}}{(1-\beta^2)} \right] \quad (5)$$

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9a) cබෙහ දෘතියෙහි තවමත් t_1 නම්

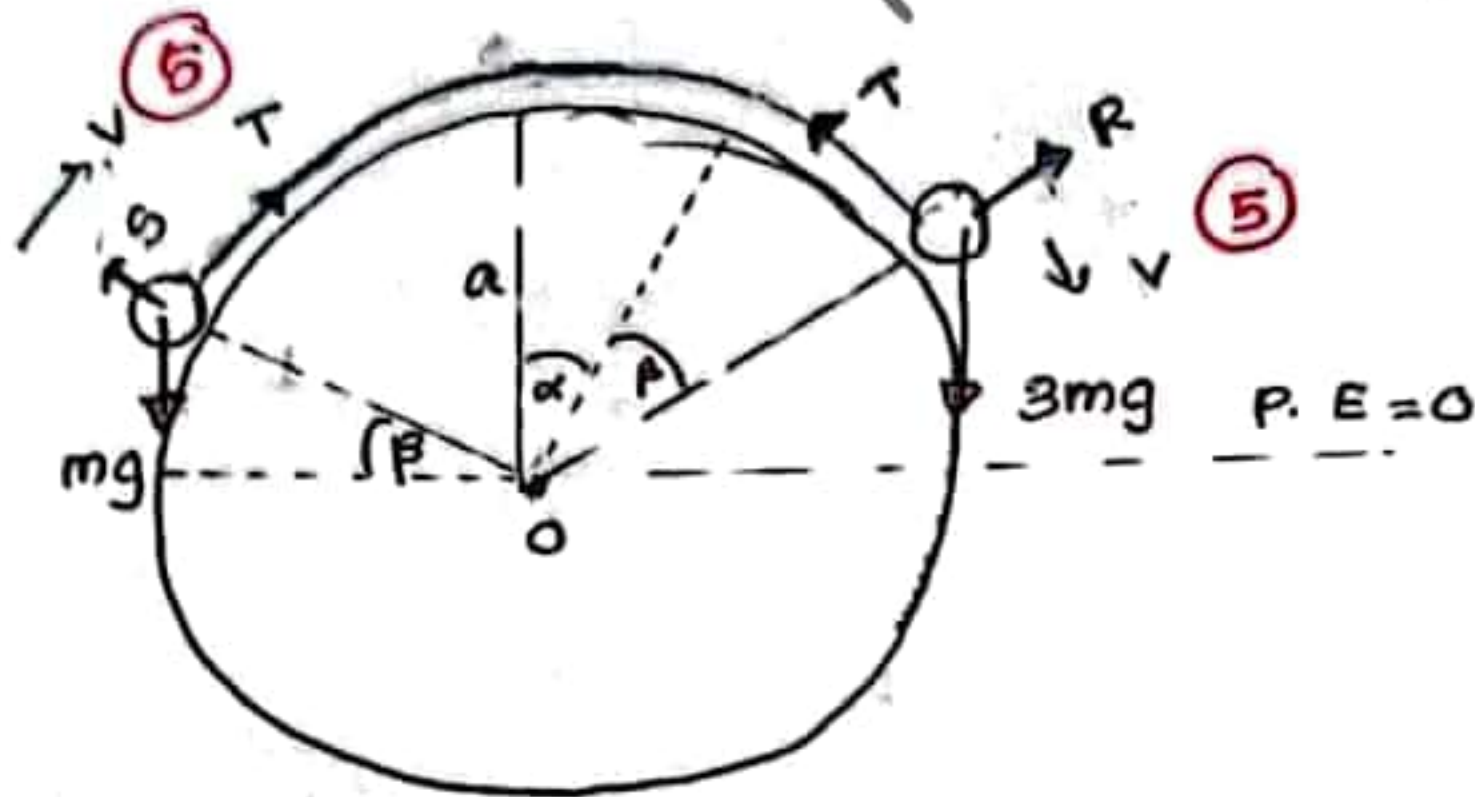
$$s = ut + \frac{1}{2}at^2$$

$$\frac{c}{2} = \frac{1}{2} \times g \sin \alpha \cdot t_1^2 \quad (10)$$

$$t_1^2 = \frac{c}{g \sin \alpha}$$

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(b)



තත්ත්ව කාලීනී දෘතියෙහි

$$3mga \cos \alpha = \frac{1}{2}mv^2 + \frac{1}{2} \times 3mv^2 + mga \sin \beta + 3mga \cos(\alpha + \beta) \quad (5)$$

$$3ga \cos \alpha - ga \sin \beta - 3ga \cos(\alpha + \beta) = 2v^2 \quad \text{සමීකරණය (5)}$$

$$v^2 = \frac{ga}{2} (3 \cos \alpha - \sin \beta - 3 \cos(\alpha + \beta)) \quad (5)$$

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3m/

$$F = ma$$

$$3mg \cos(\alpha + \beta) - R = 3m \frac{v^2}{a} \quad (10)$$

$$R = 3mg \cos(\alpha + \beta) - \frac{3mg}{2} (3 \cos \alpha - \sin \beta - 3 \cos(\alpha + \beta)) \quad (5)$$

දුරකථන නිවැරදි කර ගනිමු,

$$R = 0 \quad (5)$$

$$3mg \cos(\alpha + \beta) - \frac{3mg}{2} (3 \cos \alpha - \sin \beta - 3 \cos(\alpha + \beta)) = 0 \quad (5)$$

$$2 \cos(\alpha + \beta) = 3 \cos \alpha - \sin \beta - 3 \cos(\alpha + \beta)$$

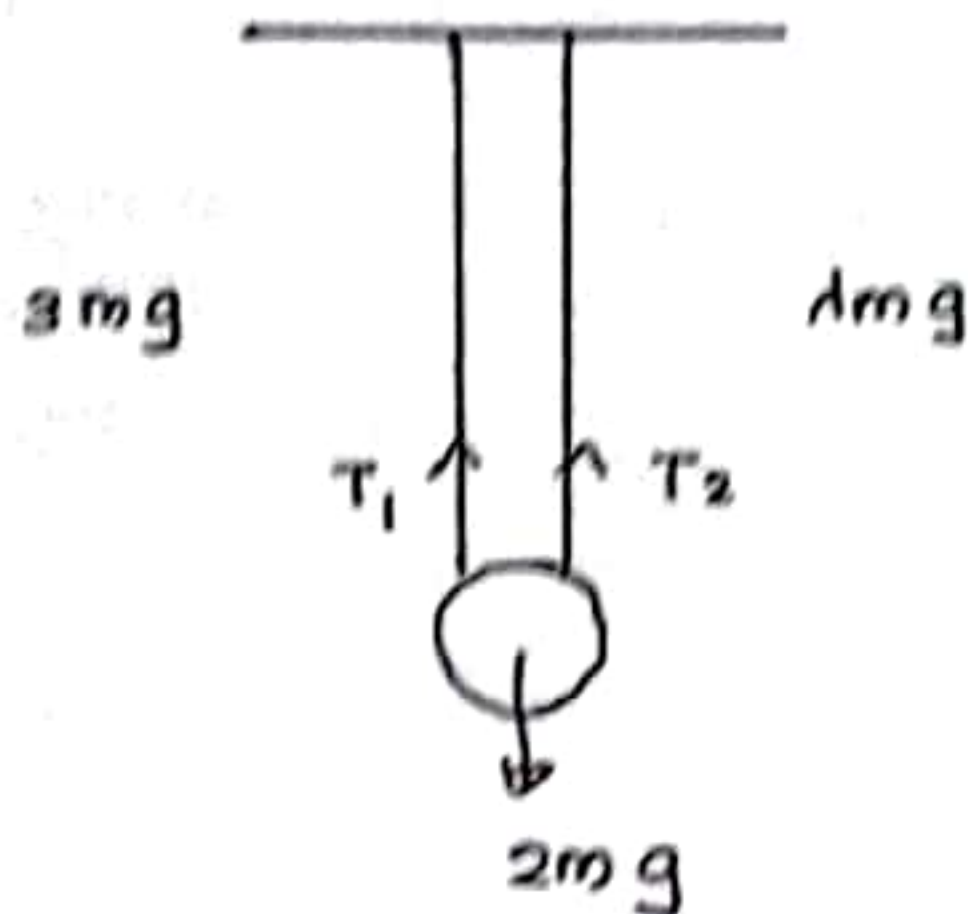
$$5 \cos(\alpha + \beta) = 3 \cos \alpha - \sin \beta \quad (5)$$

$$5 [\cos \alpha \cos \beta - \sin \alpha \sin \beta] = 3 \cos \alpha - \sin \beta$$

$$\cos \alpha (5 \cos \beta - 3) = \sin \beta (5 \sin \alpha - 1) //$$

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(13)



සමතුලිත භික්ෂුවේදී

$$T_1 + T_2 = 2mg$$

$$\frac{3mg(4a)}{4a} + \frac{4mga}{4a} = 2mg$$

$$\frac{3}{4} + \frac{\lambda}{4} = 2$$

$$\frac{\lambda}{4} = \frac{5}{4}$$

$$\lambda = 5$$

$$\downarrow I = \Delta mv$$

$$0 = 6mv - 4m \times 3\sqrt{ag}$$

$$v = 2\sqrt{ag} //$$

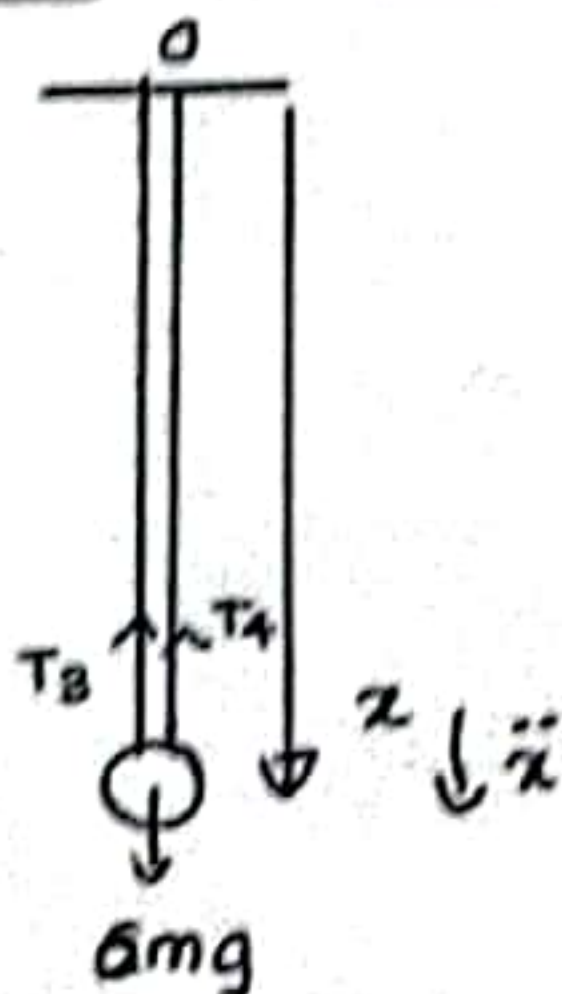
$$\downarrow v^2 = u^2 + 2as$$

$$v_o^2 = 2ag + 2g \cdot \frac{7a}{2}$$

$$v_o^2 = 9ag$$

$$v_o = 3\sqrt{ag}$$

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$$\downarrow F = ma$$

$$6mg - T_3 - T_4 = 6m\ddot{x}$$

$$6mg - \frac{3mg(x-4a)}{4a} - \frac{5mg(x-4a)}{4a} = 6m\ddot{x}$$

$$6g - \frac{3g}{4a}(x-4a) - \frac{5g}{4a}(x-4a) = 6\ddot{x}$$

$$\frac{g}{4a}(24a - 3x + 12a - 5x + 20a) = 6\ddot{x}$$

$$-\frac{g}{4a}(8x - 56a) = 6\ddot{x}$$

$$\ddot{x} + \frac{g}{3a}(x - 7a) = 0 //$$

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$$x - 7a = x$$

$$\dot{x} = \dot{x}$$

$$\ddot{x} = \ddot{x}$$

$$\ddot{x} + \frac{g}{3a} x = 0$$

$$\omega = \sqrt{\frac{g}{3a}}$$

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ලෝලන කේන්ද්‍රයේදී $\ddot{x} = 0$ ඡව්ව $x = 7a$ නා $x = 0$ වේ. 0 සිට $7a$ දුරක් සිරස්ව පහළින් ලෝලන කේන්ද්‍රය පිහිටා පුරන.

$$\dot{x}^2 = \omega^2 (A^2 - x^2)$$

$$\dot{x} = 2\sqrt{ag} \text{ විට } x = -2a$$

$$4ag = \frac{g}{3a} (A^2 - 4a^2)$$

$$12a^2 = A^2 - 4a^2$$

$$A = 4a //$$

$$\text{විස්තාරය} = 4a.$$

$$\cos \theta = \frac{2a}{4a}$$

$$\theta = \pi/3$$

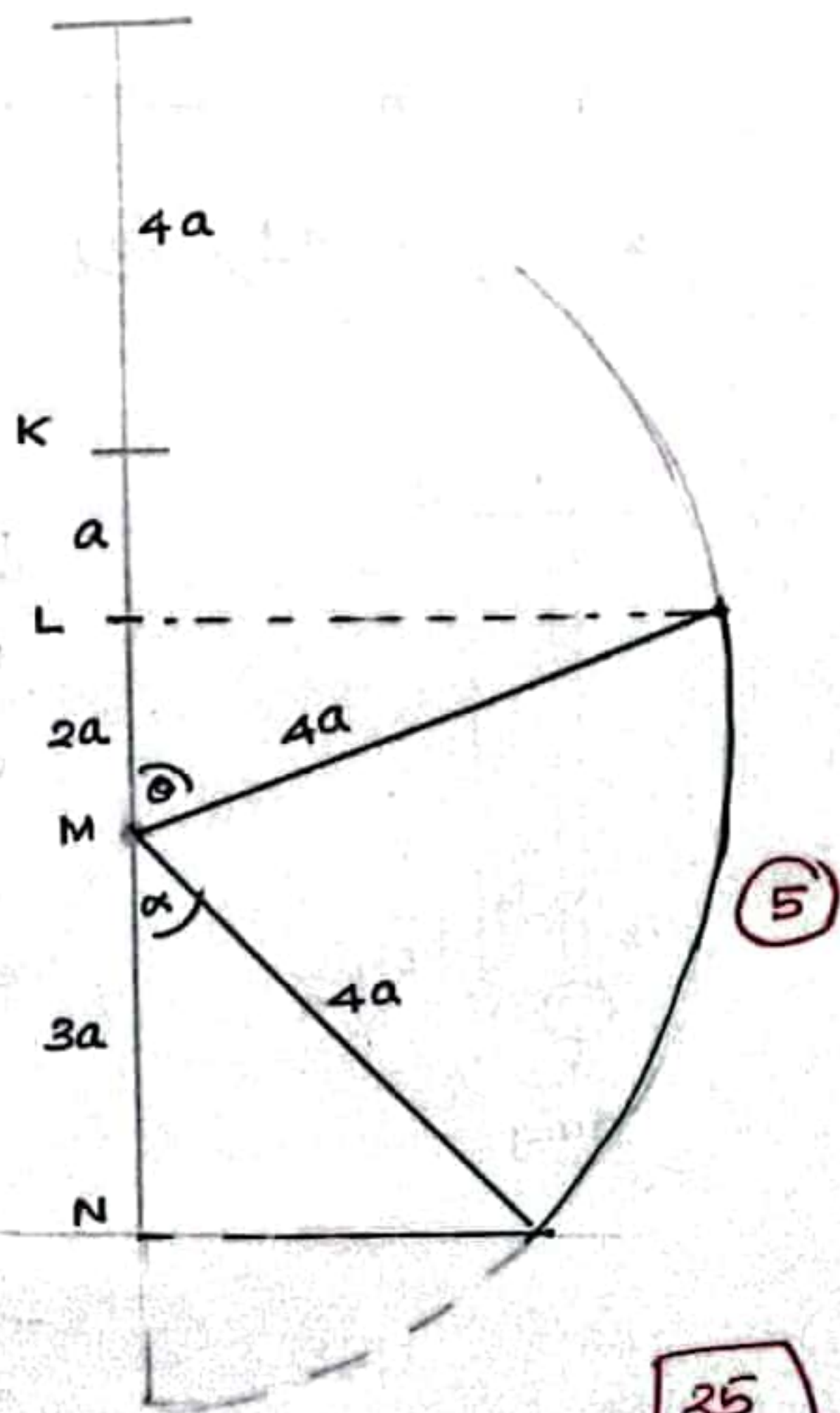
$$\cos \alpha = \frac{3a}{4a}$$

$$\alpha = \cos^{-1} \left(\frac{3}{4} \right)$$

$$L \text{ සිට } N \text{ කාලය} = \frac{\pi - \pi/3 - \cos^{-1} \left(\frac{3}{4} \right)}{\omega}$$

$$= \sqrt{\frac{3a}{g}} \left\{ \frac{2\pi}{3} - \cos^{-1} \left(\frac{3}{4} \right) \right\}$$

5



R බව චලිත ප්‍රවේගය V_1 නම්

ද්විතීයික ධ්‍රැවණය ගත වුවේද

$$\dot{x}^2 = \omega^2 (A^2 - x^2)$$

ගෙනීම මතදී $x = 3a$ (5)

$$V_1^2 = \frac{g}{3a} (16a^2 - 9a^2)$$

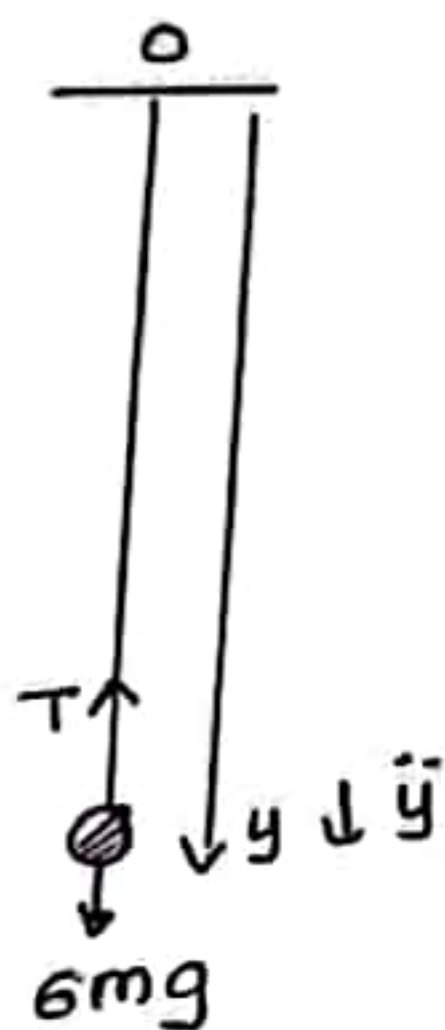
$$V_1^2 = \frac{g}{3a} \times 7a^2$$

$$V_1 = \sqrt{\frac{7}{3}ga} \quad (5)$$

$$V_2 = e V_1$$

$$V_2 = \sqrt{\frac{3}{7}} \times \sqrt{\frac{7}{3}ga}$$

$$V_2 = \sqrt{ga} \quad (5)$$



$$\downarrow F = ma$$

$$6mg - T = 6m\ddot{y} \quad (5)$$

$$6mg - \frac{3mg(y - 4a)}{4a} = 6m\ddot{y} \quad (5)$$

$$2g - \frac{g}{4a}(y - 4a) = 2\ddot{y}$$

$$-\frac{g}{4a}(y - 4a - 8a) = 2\ddot{y}$$

$$\ddot{y} + \frac{g}{8a}(y - 12a) = 0 \quad (5)$$

ප්‍රේමණ කේන්ද්‍රය $\ddot{y} = 0 \Rightarrow y = 12a$

0 සිට $12a$ ඔරුමා පහළින් ප්‍රේමණ කේන්ද්‍රය නිකටයි.

$$y - 12a = Y$$

$$\dot{y} = \dot{Y}$$

$$\ddot{y} = \ddot{Y}$$

$$\ddot{Y} + \frac{g}{8a}Y = 0 \quad (5)$$

$$\dot{Y}^2 = \frac{g}{8a}(B^2 - Y^2)$$

$$\dot{Y} = -\sqrt{ga} \quad \text{හිට} \quad Y = -2a \quad (5)$$

$$ga = \frac{g}{8a}(B^2 - 4a^2)$$

$$8a^2 = B^2 - 4a^2$$

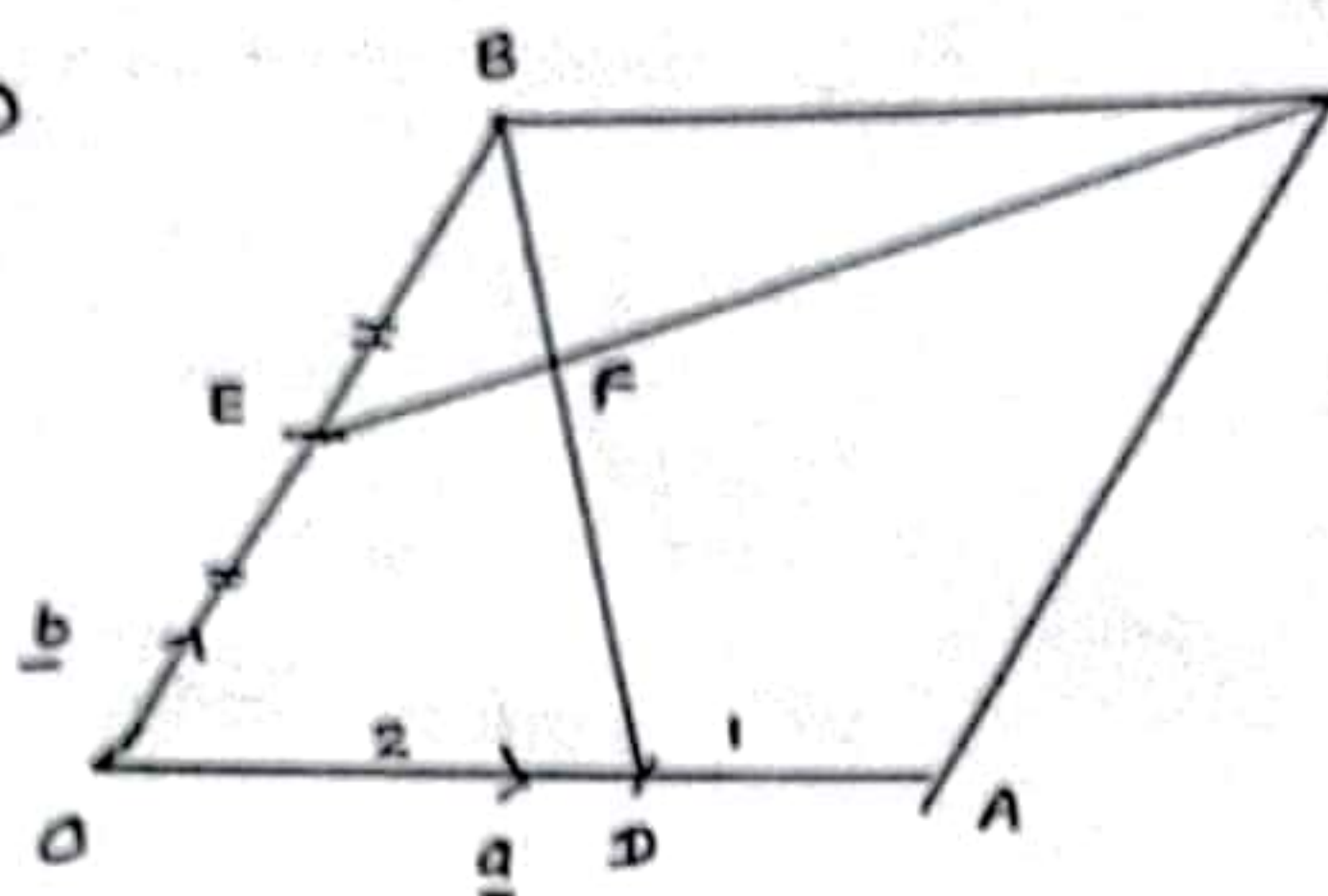
$$B = \sqrt{12}a$$

$$\text{චක්ෂාරය} \quad \sqrt{12}a \quad (5)$$

ප්‍රේමණ කේන්ද්‍රයේදී

$$Y = 0 \quad \omega_1 = \sqrt{\frac{g}{8a}}$$

(14)



$$\overrightarrow{BD} = \overrightarrow{BO} + \overrightarrow{OD} \quad (5)$$

$$= -\underline{b} + \frac{2}{3} \overrightarrow{OA} \quad (5)$$

$$= -\underline{b} + \frac{2}{3} \underline{a} \quad (5)$$

$$= \frac{1}{3} (2\underline{a} - 3\underline{b}) //$$

$$\overrightarrow{CE} = \overrightarrow{CB} + \overrightarrow{BE}$$

$$= -\underline{a} + \frac{1}{2} \overrightarrow{BO} \quad (5)$$

$$= -\underline{a} - \frac{1}{2} \underline{b}$$

$$= -\frac{1}{2} (\underline{b} + 2\underline{a}) //$$

$$\overrightarrow{FE} = \lambda \overrightarrow{CE}$$

$$\overrightarrow{BF} = \mu \overrightarrow{BD}$$

$$\overrightarrow{BE} = \overrightarrow{BF} + \overrightarrow{FE}$$

$$-\frac{1}{2} \underline{b} = \mu \overrightarrow{BD} + \lambda \overrightarrow{CE} \quad (5)$$

$$-\frac{1}{2} \underline{b} = \mu \left(\frac{1}{3} (2\underline{a} - 3\underline{b}) \right) - \frac{\lambda}{2} (\underline{b} + 2\underline{a}) \quad (5)$$

$$-\frac{1}{2} \underline{b} = \underline{a} \left(\frac{2}{3} \mu - \lambda \right) + \underline{b} \left(-\mu - \frac{\lambda}{2} \right)$$

$$\left(\frac{2}{3} \mu - \lambda \right) \underline{a} + \underline{b} \left(\mu + \frac{\lambda}{2} - \frac{1}{2} \right) = 0$$

$$\frac{2}{3} \mu - \lambda = 0 \quad \text{or}$$

$$\mu + \frac{\lambda}{2} - \frac{1}{2} = 0$$

$$(\underline{a} \nparallel \underline{b})$$

$$\lambda = \frac{2}{3} \mu$$

$$\mu + \frac{\mu}{3} = \frac{1}{2}$$

$$\frac{4\mu}{3} = \frac{1}{2}$$

$$\mu = \frac{3}{8} \quad (5)$$

$$\lambda = \frac{2}{3} \times \frac{3}{8}$$

$$\lambda = \frac{1}{4} //$$

(5)

$\overrightarrow{BD} \perp \overrightarrow{CE}$ అని

$$\overrightarrow{BD} \cdot \overrightarrow{CE} = 0 \quad (5)$$

$$\frac{1}{3} (2a - 3b) \cdot \left[-\frac{1}{2} (b + 2a) \right] = 0 \quad (5)$$

$$(2\underline{a} - 3\underline{b})(\underline{b} + 2\underline{a}) = 0$$

$$2\underline{a} \cdot \underline{b} + 4\underline{a} \cdot \underline{a} - 3\underline{b} \cdot \underline{b} - 6\underline{a} \cdot \underline{b} = 0$$

$$4|a|^2 - 4a \cdot b - 3|b|^2 = 0 \quad (5)$$

(i) OACB රොච්ඤයක් නම්,

$$OA = OB$$

$$|a| = |b|$$

$$4|\underline{a}|^2 - 4|\underline{a}||\underline{a}| \cdot \cos \theta - 3|\underline{a}|^2 = 0$$

$$1 = 4 \cos \theta$$

$$\cos \theta = \frac{1}{4}$$

$$\theta = \cos^{-1} \left(\frac{1}{4} \right) \quad (5)$$

(110) OACB කළ නොහැකි බව

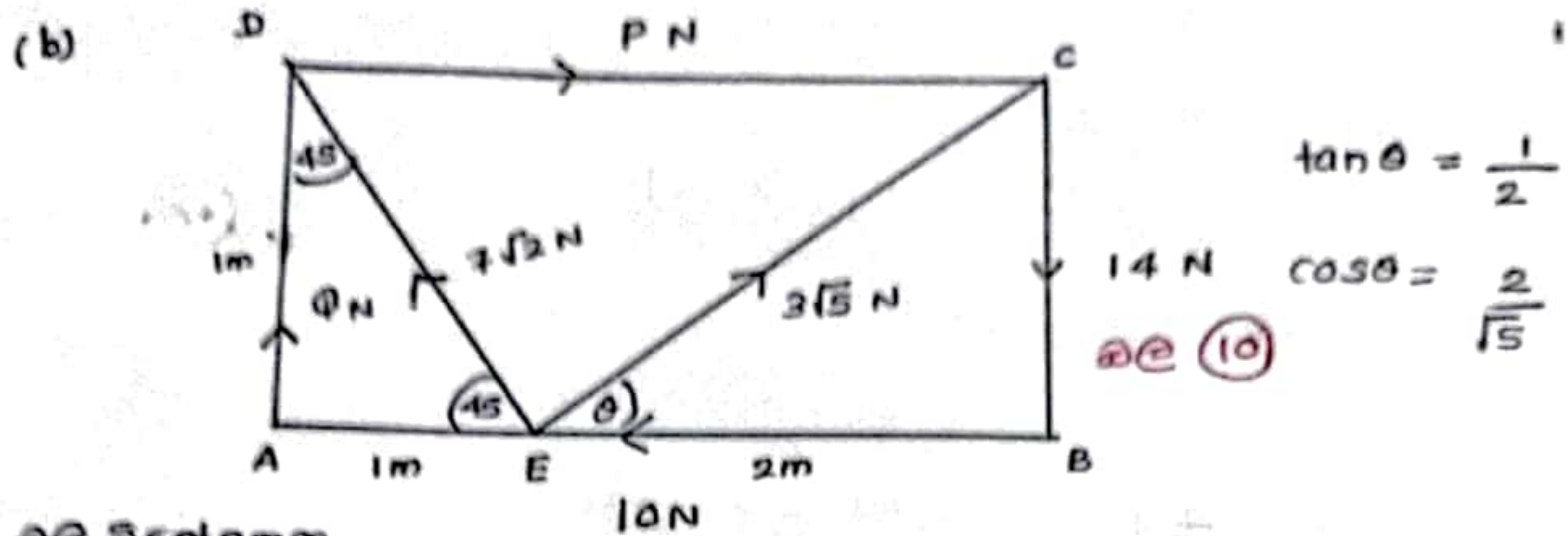
$$\underline{a} \cdot \underline{b} = 0$$

$$4|a|^2 - 3|b|^2 = 0$$

$$|a|^2 = \frac{3}{4} |b|^2$$

$$|a| = \frac{\sqrt{3}}{2} \quad |b| \quad \textcircled{5}$$

23' AL API (PAPERS GROUP)



മല തിരക്കുക

$$\begin{aligned} \rightarrow X &= P - 10 - 7\sqrt{2} \times \frac{1}{\sqrt{2}} + 3\sqrt{5} \cos \theta \quad (5) \\ &= P - 10 - 7 + 3\sqrt{5} \times \frac{2}{\sqrt{5}} \\ &= P - 11 \end{aligned}$$

$$\begin{aligned} \uparrow Y &= Q - 14 + 7\sqrt{2} \times \frac{1}{\sqrt{2}} + 3\sqrt{5} \sin \theta \quad (5) \\ &= Q - 14 + 7 + 3\sqrt{5} \times \frac{1}{\sqrt{5}} \\ &= Q - 4 \end{aligned}$$

$$\begin{aligned} \text{D)} \quad G &= -10 \times 1 - 14 \times 3 + 3\sqrt{5} \sin \theta \times 3 \quad (10) \\ &= -10 - 42 + 3\sqrt{5} \times \frac{1}{\sqrt{5}} \times 3 \\ &= -43 \\ G &= 43 \text{ Nm} \quad (5) \end{aligned}$$

$R \neq 0$ അല്ലെങ്കിൽ $G \neq 0$ ക്കാ പലതരം സന്തുലനാവസ്ഥകൾ

അവസ്ഥകൾ

(ii) പലതരം സന്തുലനാവസ്ഥകൾ ഉണ്ടാകാൻ വേണ്ടി,

$R = 0$ അല്ലെങ്കിൽ $G = 0$.

$$\begin{aligned} \rightarrow X &= 0 & \uparrow Y &= 0 \\ P - 11 &= 0 & Q - 4 &= 0 \\ P &= 11 \quad (5) & Q &= 4 \quad (5) \end{aligned}$$

(m) $x = 7 - 11 = -4$ $y = 8 - 4 = 4$
 $\leftarrow x = 4 \text{ N}$ (5) $\uparrow y = 4 \text{ N}$ (5)



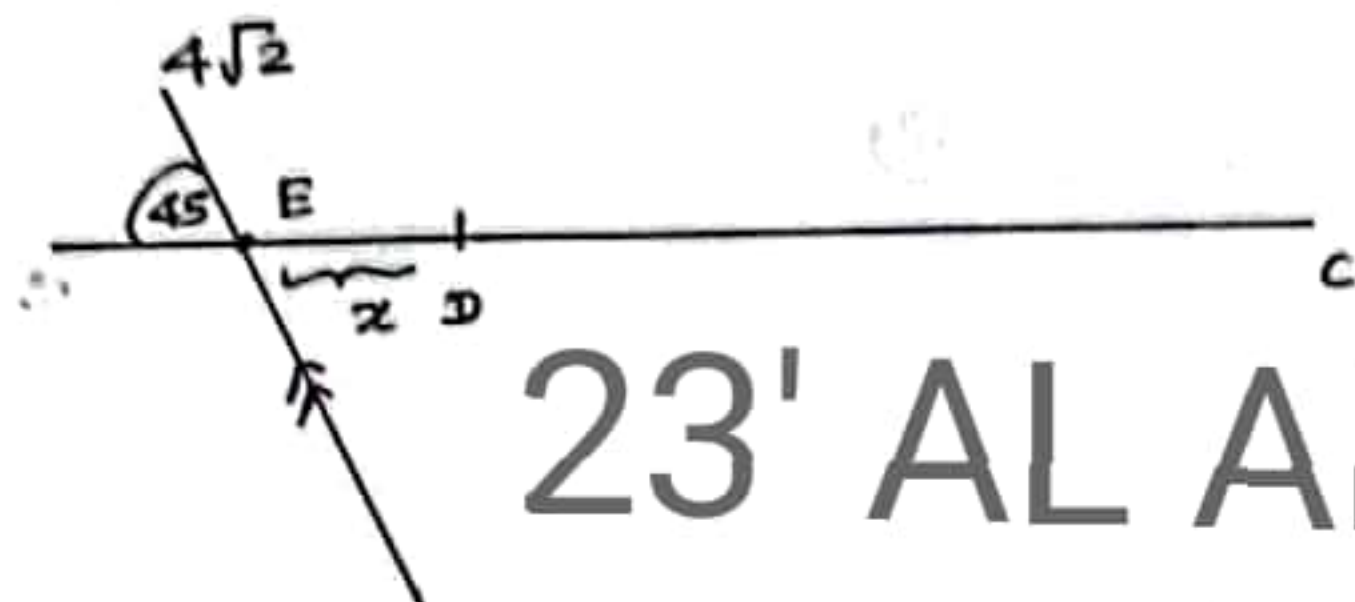
$$R = \sqrt{16 + 16}$$

$$R = 4\sqrt{2} \text{ N} //$$
 (5)

$$\tan \alpha = \frac{4}{4} = 1$$

$$\alpha = \frac{\pi}{4}$$
 (5)

සමීകරණය ED ට සමාන්තර වන අතර E සිට D දුරට වූ දිශාවට වේ.



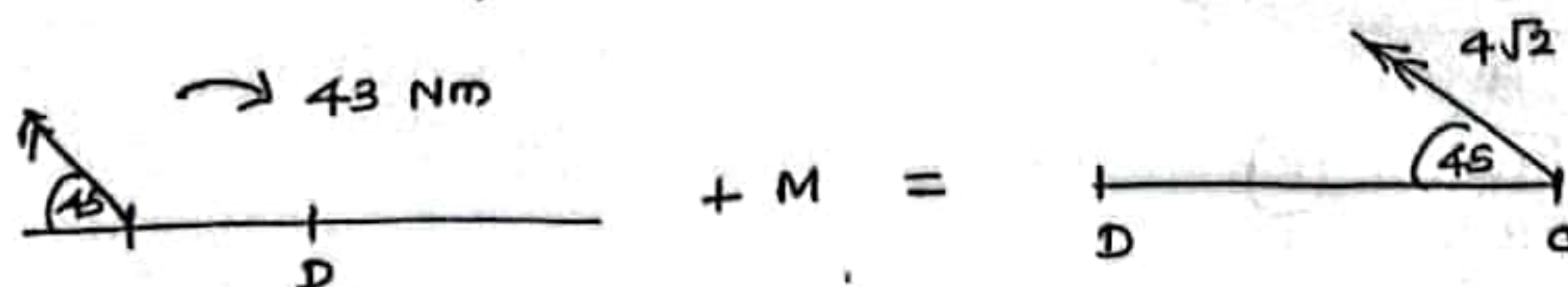
23' AL API (PAPERS G

2) සමීකරණය වගන්තු කිරීම = මෙම පද්ධතිය වගන්තු කිරීම.

$$43 = 4 \times x$$

$$x = \frac{43}{4} \text{ m}$$
 (5)

D හි සිට $\frac{43}{4} \text{ m}$ දුරින් දිශාවට මෙම පද්ධතිය පිහිටා ඇත.



$$\sum M_D = 43 + M = -4 \times 3$$

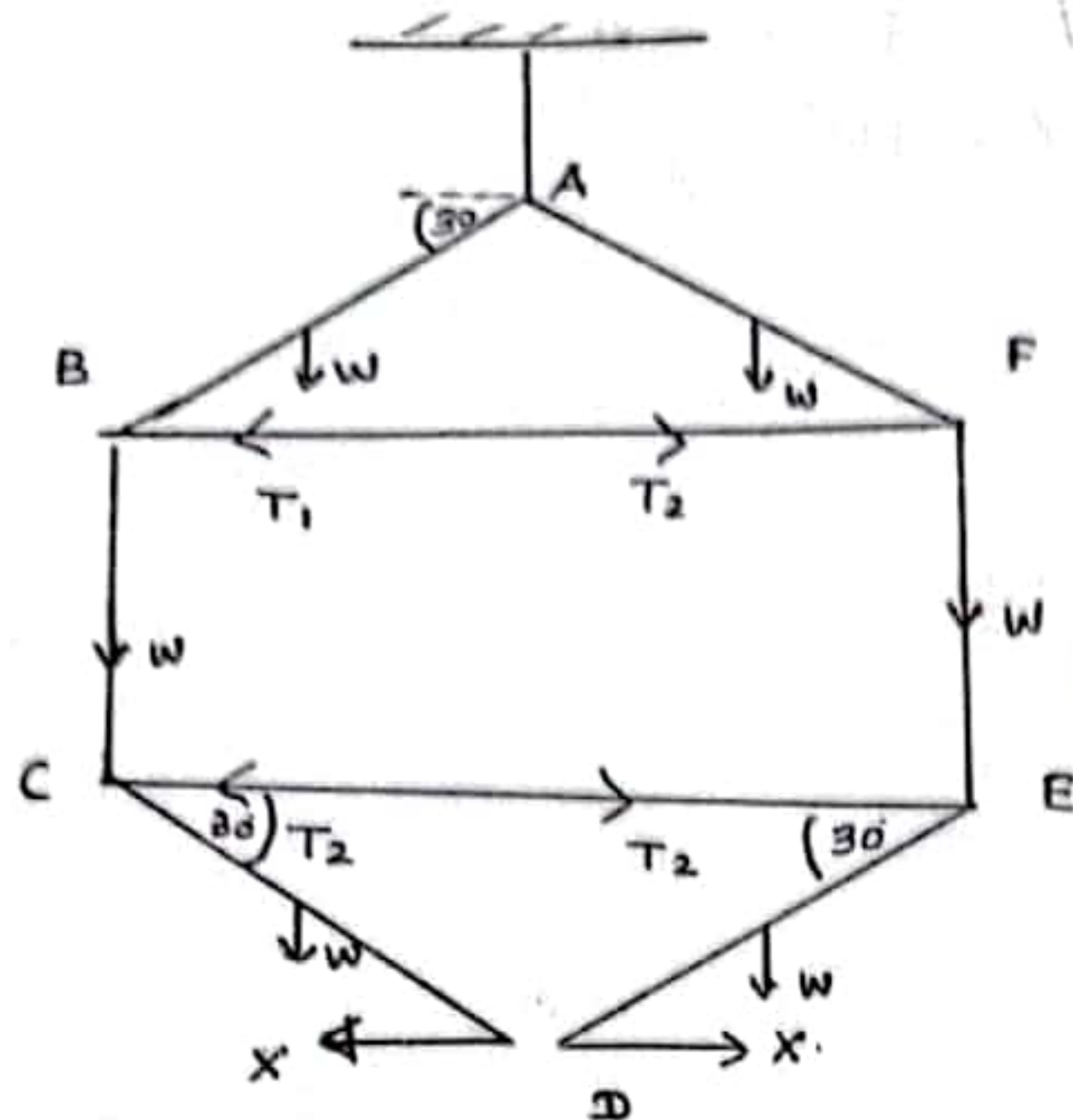
$$M = -12 - 43$$

$$M = -55 \text{ Nm}$$

$$M = 55 \text{ Nm}$$
 (5)

දිශාව - නැතරේ වේ.

(15)



කම්බිකරණය ඉහළ ධනයි

$$y = 0 \quad (5)$$

(10) බල

CD දෘඪාංගයේ C දී

$$-x \times a \sin 30^\circ - w \times \frac{a}{2} \cos 30^\circ = 0 \quad (10)$$

$$x \times \frac{1}{2} + \frac{w}{2} \times \frac{\sqrt{3}}{2} = 0$$

$$x = -\frac{\sqrt{3}w}{2} \quad (5)$$

BC, CD දෘඪාංගයේ B දී

$$T_2 \times a + x \times (a + a \sin 30^\circ) + w \times \frac{a}{2} \cos 30^\circ = 0 \quad (10)$$

$$T_2 a = \frac{\sqrt{3}w}{2} \left(\frac{3a}{2} \right) + \frac{w a}{2} \times \frac{\sqrt{3}}{2}$$

$$T_2 a = \frac{3\sqrt{3}wa}{4} - \frac{\sqrt{3}wa}{4}$$

$$T_2 = \frac{\sqrt{3}w}{2} \quad (5)$$

AB, BC, CD දෘඪාංගයේ A දී

$$-w \times \frac{a \cos 30^\circ}{2} \times 2 - w \times a \cos 30^\circ + x \times (a + 2a \sin 30^\circ) + T_2 \times (a + a \sin 30^\circ) + T_1 \times a \sin 30^\circ = 0 \quad (15)$$

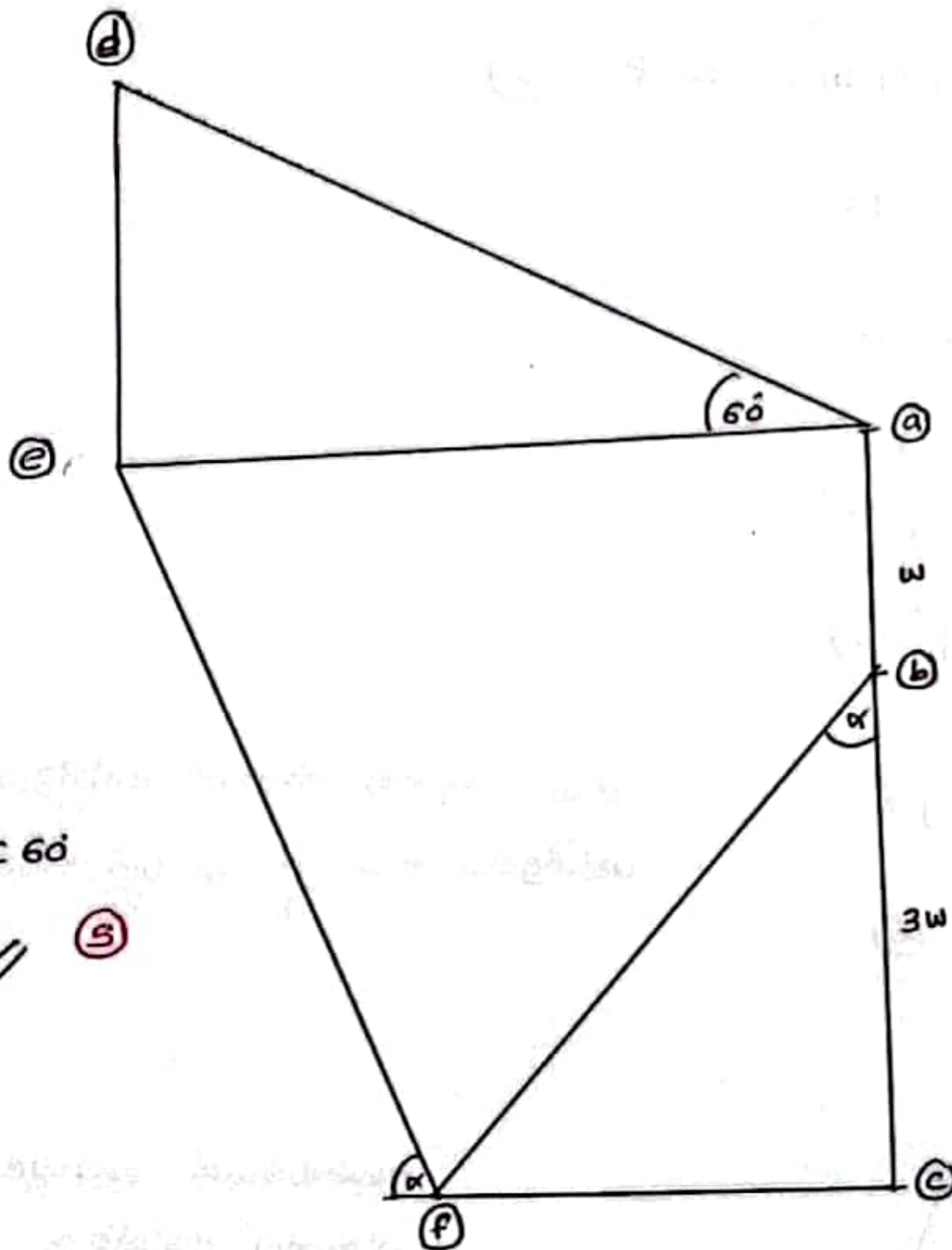
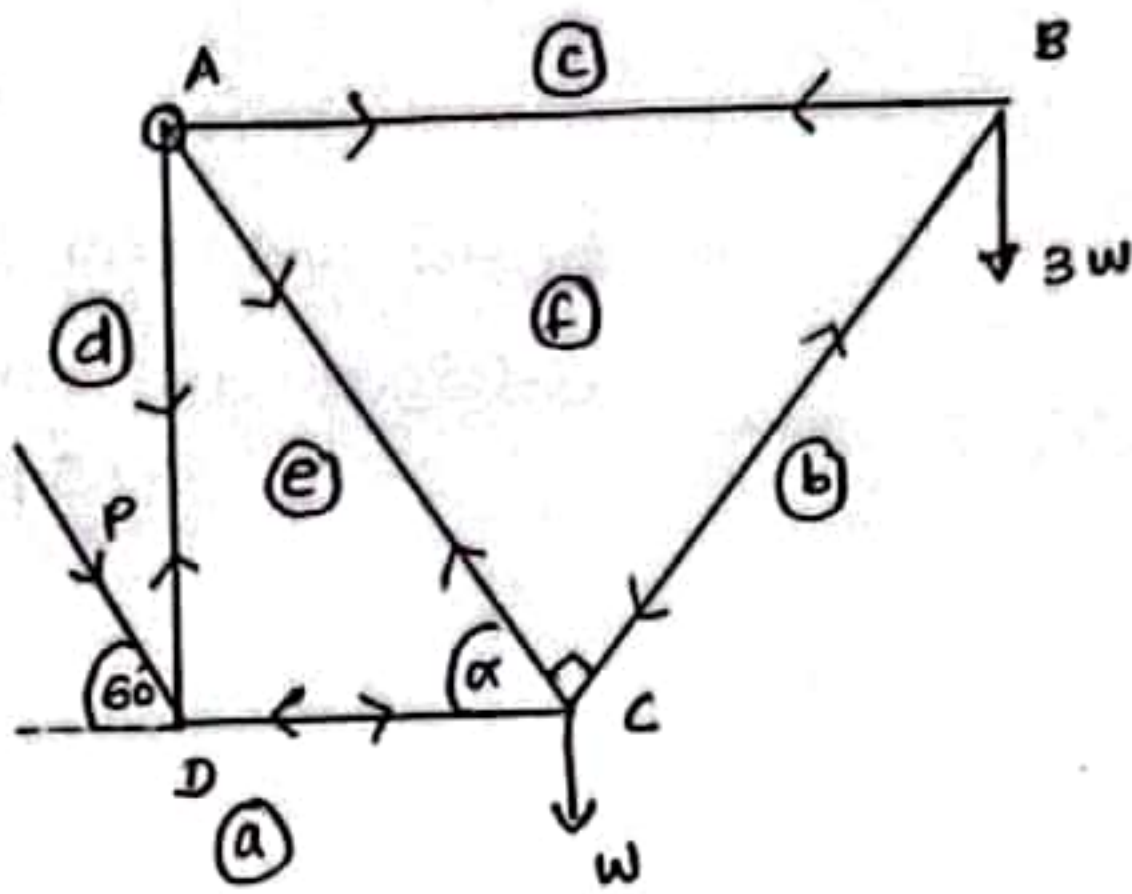
$$-2w \times \frac{\sqrt{3}a}{2} - \frac{\sqrt{3}w}{2} \times 2a + \frac{\sqrt{3}w}{2} \times \frac{3a}{2} + T_1 \times \frac{a}{2} = 0$$

$$T_1 = 2\sqrt{3}w + 2\sqrt{3}w - \frac{3\sqrt{3}w}{2}$$

$$T_1 = \frac{9\sqrt{3}w - 3\sqrt{3}w}{2}$$

$$T_1 = \frac{5\sqrt{3}w}{2} \quad (5)$$

(b)

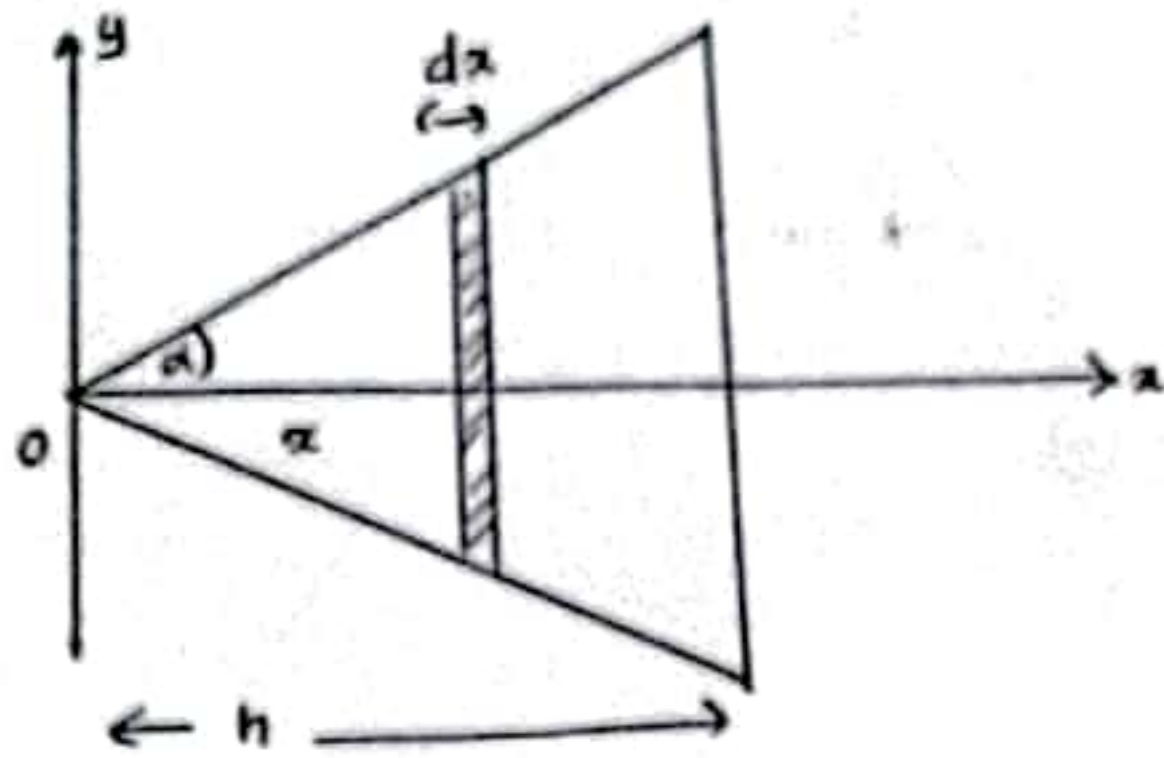


$$\begin{aligned}
 P &= w \sec 60^\circ \\
 &= 7w \sec 60^\circ \\
 &= 14w \quad (5)
 \end{aligned}$$

(30)

ഭാഗം	ബലം	സ്വഭാവം.
CD	7w (5)	തോളം (5)
BC	5w (5)	തോളം (5)
AB	4w (5)	മുതലി (5)
AC	5w (5)	മുതലി (5)
AD	7√3w (5)	മുതലി. (5)

(16)



කම්බිකයේ න්‍ය භේදයේ ජනක
 කේන්ද්‍රය 0x දිශය වෙ පිහිටයි.
 (5)

$$\bar{x} = \frac{\int_0^h \pi x^2 \tan^2 \alpha \cdot dx \cdot x}{\int_0^h \pi x^2 \tan^2 \alpha \cdot dx} \quad (5)$$

$$\bar{x} = \frac{\int_0^h x^3 dx}{\int_0^h x^2 dx} \quad (5)$$

$$\bar{x} = \frac{\frac{x^4}{4} \Big|_0^h}{\frac{x^3}{3} \Big|_0^h} \quad (5)$$

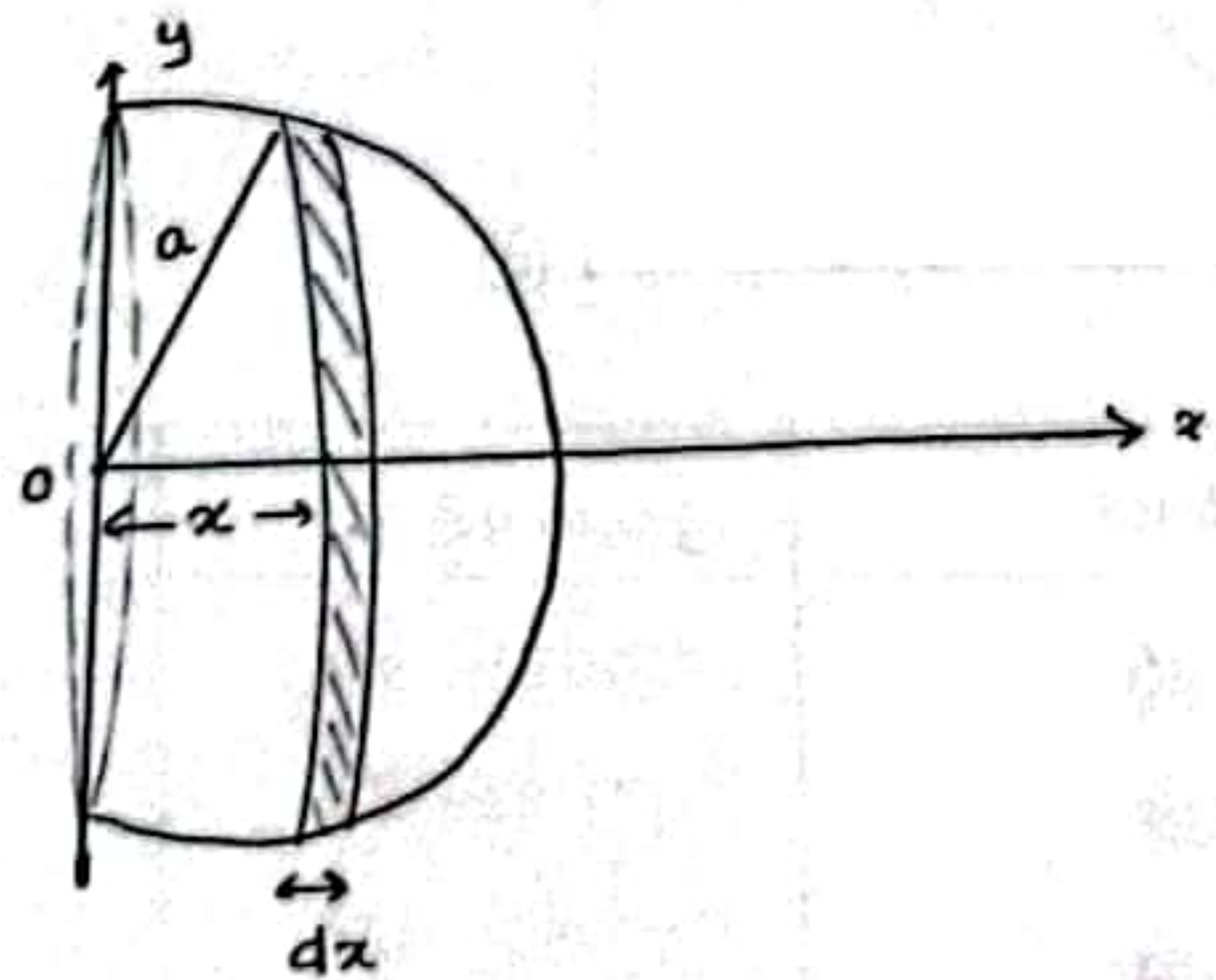
$$\bar{x} = \frac{\frac{h^4}{4}}{\frac{h^3}{3}} \quad (5)$$

$$\bar{x} = \frac{h^4}{4} \cdot \frac{3}{h^3} \quad (5)$$

$$\bar{x} = \frac{3h}{4} \quad (5)$$

න්‍ය භේදයේ ජනක කේන්ද්‍රය ආ
 ගිරිමයේ සිට $\frac{3h}{4}$ දුරින් පිහිටයි

30



කම්බිකයේ න්‍ය දුරක කේන්ද්‍රයේ
 ජනක කේන්ද්‍රය 0x දිශය
 වෙ පිහිටයි.
 (5)

$$\bar{x} = \frac{\frac{a^2 x^2}{2} - \frac{x^4}{4} \Big|_0^a}{a^2 x - \frac{x^3}{3} \Big|_0^a} \quad (5)$$

$$= \frac{\frac{a^4}{2} - \frac{a^4}{4}}{a^3 - \frac{a^3}{3}} \quad (5)$$

$$= \frac{\frac{a^4}{2} - \frac{a^4}{4}}{a^3 - \frac{a^3}{3}} = \frac{a^4}{4} \times \frac{3}{2a^3} \quad (5)$$

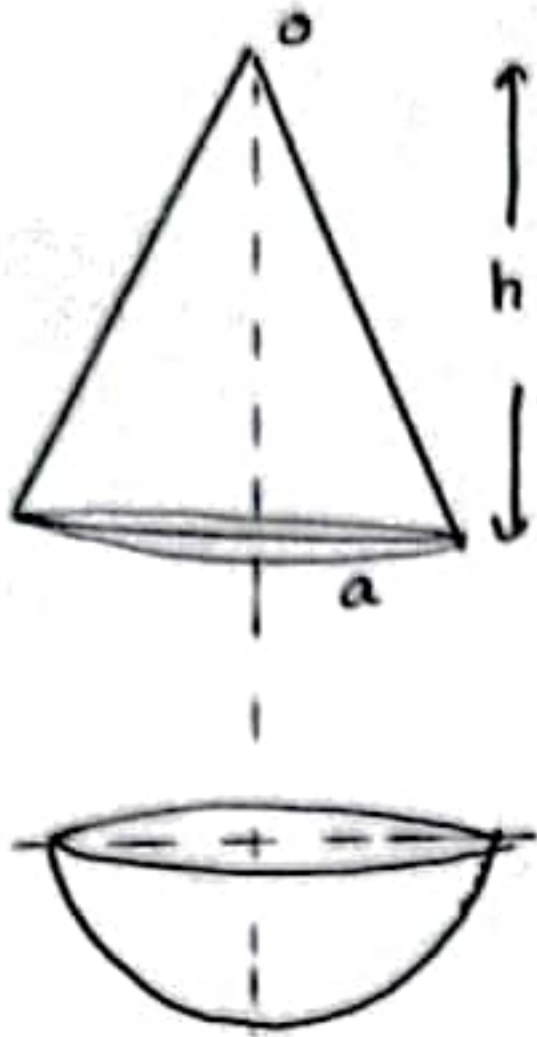
$$= \frac{3a}{8} \quad (5)$$

30

உத்குல

ഭവനം

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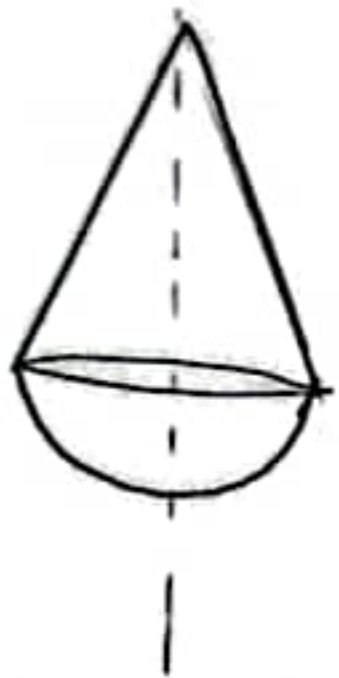


$$\frac{1}{3} \pi a^2 h \cdot \rho \quad (5)$$

$$\frac{3h}{4} \quad (s)$$

$$\frac{2}{3} \pi a^3 \rho k$$

$$h + \frac{3a}{8} \quad (5)$$



$$\frac{1}{3} \pi a^2 \rho (h + 2ak) \quad (5)$$

五

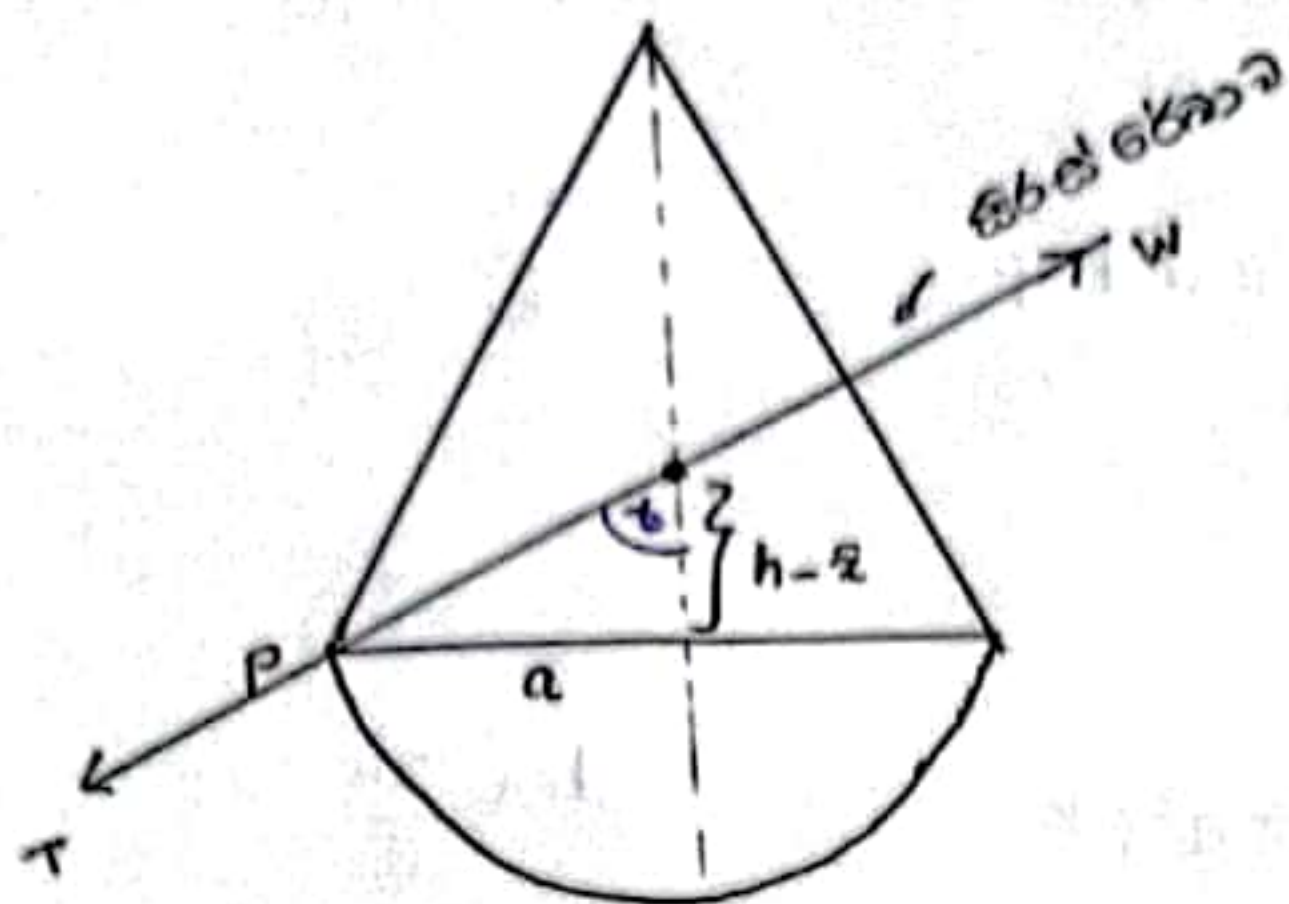
කම්මන්තියෙන් මික්කුවේ ස්වයං සේවය කමමිතික අයුරු වන පිණිස.

$$\bar{z} = \frac{\frac{1}{3} \pi a^2 h \rho \times \frac{3h}{4} + \frac{2}{3} \pi a^3 \rho k \times \left(h + \frac{3a}{8}\right)}{\frac{1}{3} \pi a^2 \rho (h + 2ak)}$$

$$\bar{x} = \frac{\frac{3h^2}{4} + 2ak \left(h + \frac{3a}{8} \right)}{(h + 2ak)} \quad (5)$$

$$= \frac{3h^2 + 9k(8h+3a)}{4(h+2ak)}$$

$$\bar{z} = \frac{k(3a^2 + 8ah) + 3h^2}{4(h + 2ak)} \quad (5)$$



$$\begin{aligned}
 \tan \alpha &= \frac{a}{h-z} \quad (5) \\
 &= \frac{a}{h - \frac{k(3a^2 + 8ah) + 3h^2}{4(2ka + h)}} \quad (5) \\
 &= \frac{4a(2ka + h)}{8kah + 4h^2 - 3a^2k - 8kah - 3h^2} \\
 &= \frac{4a(2ka + h)}{h^2 - 3a^2k} \quad (5)
 \end{aligned}$$

(b) $z = h = 2a$ (5)

$$\frac{k(3a^2 + 8ah) + 3h^2}{4(2ka + h)} = 2a$$

$$\begin{aligned}
 3a^2k + 8kah + 3h^2 &= 16ka^2 + 8ah \quad (5) \\
 3a^2k + 16ka^2 + 12a^2 &= 16ka^2 + 16a^2
 \end{aligned}$$

$$3a^2k = 4a^2$$

$$k = \frac{4}{3} \quad (5)$$

$$(17) \quad \text{පළමුවෙන් ගත් කෝළ දෙකම කැප් පාට වීමේ} = \frac{{}^5C_2}{{}^{10}C_2} \quad (10)$$

$$= \frac{5 \times 4}{10 \times 9}$$

$$= \frac{2}{9} \quad (5)$$

15

(ii) පළමුවෙන් ඉවත් ගත් කෝළ දෙකම = A
කැප් වීම

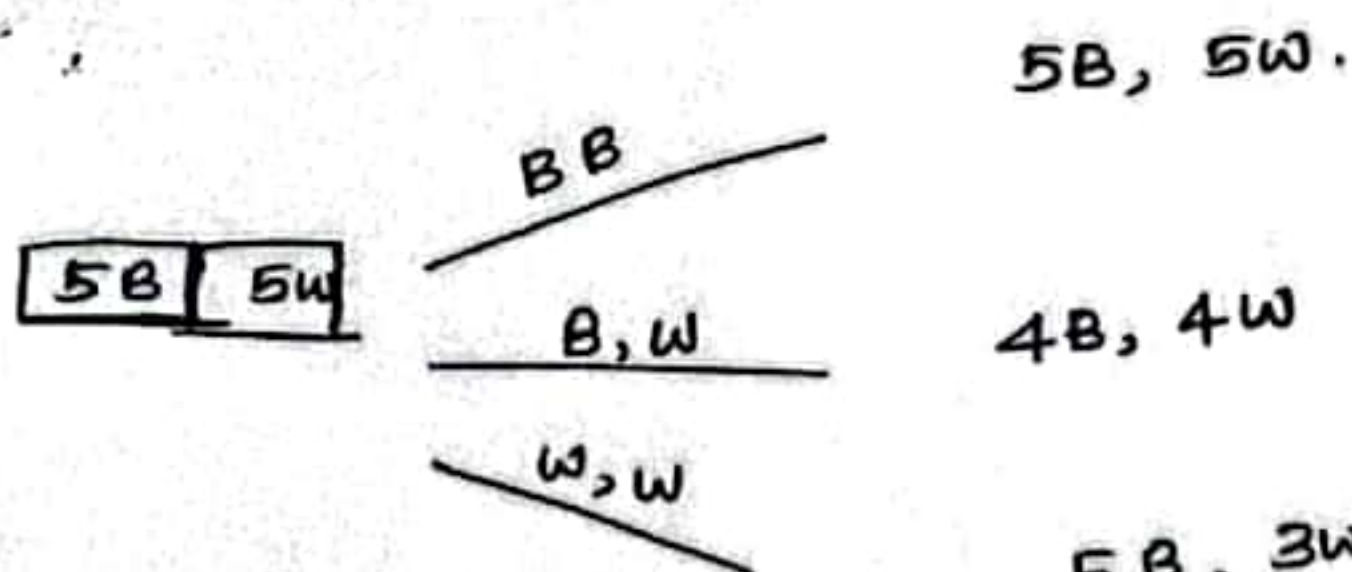
දෙවන වරට ඉවත් ගත් කෝළ දෙකම = B
කැප් වීම

$$P(B|A) = \frac{2}{9} \quad \text{--- } (10)$$

$$(iii) \quad P(A|B) = \frac{P(A \cap B)}{P(B)}$$

$$= \frac{P(B|A) \cdot P(A)}{P(B)}$$

2 වැනි වරට



$$P(B) = \frac{2}{9} \times \frac{2}{9} + \frac{{}^5C_1 \times {}^5C_1}{{}^{10}C_2} \times \frac{{}^4C_2 \times {}^4C_0}{{}^8C_2} + \frac{{}^5C_0 \times {}^5C_2}{{}^{10}C_2} \times \frac{{}^5C_2 \times {}^3C_0}{{}^8C_2}$$

$$= \frac{4}{81} + \frac{6}{28} \times \frac{25}{45} + \frac{10}{28} \times \frac{10}{45} \quad (5)$$

$$= \frac{281}{9 \times 9 \times 14} \quad (5)$$

$$P(A|B) = \frac{2/9 \times 2/9}{281}$$

$$= \frac{56}{281}$$

50

$$P(B|A) = \frac{1}{4}$$

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

$$= \frac{P(B|A) \cdot P(A)}{P(B)}$$

$$P(B) =$$

$$P(A) =$$

$$P(A \cap B) =$$

$$P(A) =$$

$$P(B) =$$

$$P(A \cap B) =$$

$$P(A) =$$

$$P(B) =$$

(17) (b)

അളവ്	f	x	fx	fx ²
10-20	7	15	105	1575
20-30	12	25	300	7500
30-40	20	35	700	24500
40-50	7	45	315	14175
50-60	4	55	220	12100
	$\Sigma f = 50$		$\Sigma fx = 1640$	$\Sigma fx^2 = 59850$

$$(a) \bar{x} = \frac{\Sigma fx}{\Sigma f} = \frac{1640}{50} = \underline{\underline{32.8}}$$

$$\begin{aligned}
 (b) s &= \sqrt{\frac{\Sigma fx^2}{\Sigma f} - \left(\frac{\Sigma fx}{\Sigma f}\right)^2} \\
 &= \sqrt{\frac{59850}{50} - \left(\frac{1640}{50}\right)^2} \\
 &= \sqrt{\frac{6058}{50}} \\
 &= \sqrt{121.16} \\
 &= 11.007//
 \end{aligned}$$

$$\begin{aligned}
 (c) \text{ മൊട്ടകൾ } &= 30 + \left(\frac{25 - 19}{20}\right) \times 10 \\
 &= 30 + \frac{6}{2} \\
 &= 33//
 \end{aligned}$$

$$\begin{aligned}
 (d) \text{ തുക } &= 30 + \left(\frac{8}{8+9}\right) 10 \\
 &= 30 + \frac{80}{17} \\
 &= 30 + 4.7 \\
 &= 34.7//
 \end{aligned}$$

$$\text{Ans } \sum fx = 1640 - 25 - 41 + 10 + 6 \quad (5)$$

$$= 1656$$

$$\bar{x} = \frac{1656}{50}$$

$$\bar{x} = 33.12 \quad (5)$$

75



23, AL API

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