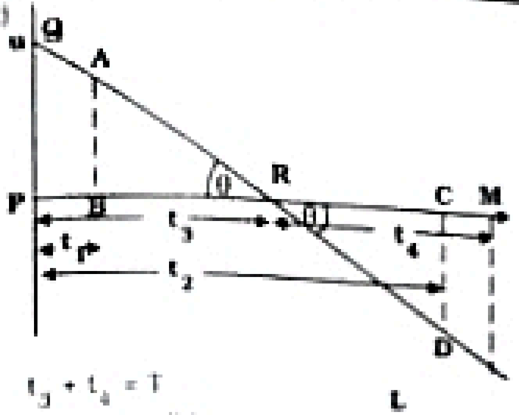
8. (a) (i)



$t_3 + t_4 = T$

$\tan\theta = \frac{PQ}{PR} \Rightarrow g = \frac{u}{t_3}$

$t_3 = \frac{u}{g} \quad \therefore PQR\Delta = \frac{u^2}{2g}$

$\therefore RML\ \Delta = \frac{u^2}{2g}$ [illegible]

$\tan\theta = \frac{ML}{t_4} = g$

$RML\ \Delta = \frac{1}{2} t_4 \cdot g t_4 = \frac{u^2}{2g}$

$t_4^2 = \frac{u^2}{g^2} \quad \Rightarrow t_4 = \frac{u}{g}$

$\therefore t_3 = t_4 = \frac{u}{g}$ [illegible] $T = \frac{2u}{g}$

[illegible]

$= PQR\ \Delta = \frac{u^2}{2g}$

$BR = \frac{u}{g} - t_1$

$RC = t_2 - \frac{u}{g} \quad \left(\because PR = \frac{u}{g} \right)$

t_1 [illegible] t_2 [illegible]

$ABR\ \Delta = RCD\ \Delta$

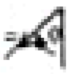
$\therefore BR = RC$ [illegible]

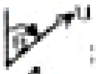
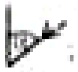
$(\because \frac{1}{2}\ BR\ gBR = \frac{1}{2} RC.gRC,$ [illegible]

$AB = g\ Br$ [illegible] $CD = g\ RC$ [illegible]

$\frac{u}{g} - t_1 = t_2 - \frac{u}{g} \Rightarrow$

$t_1 + t_2 = \frac{2u}{g} = T$

(ii) (A E) = ↑V ; (B E) =  ;

(C E) =  ; (B A) =  ;

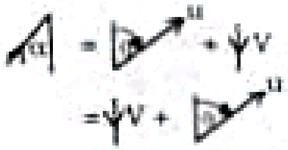
(C A) =

(B A) = (B E) + (E A)

$= \overrightarrow{XY} + \overrightarrow{YZ_1}$

$= \overrightarrow{XZ_1}$

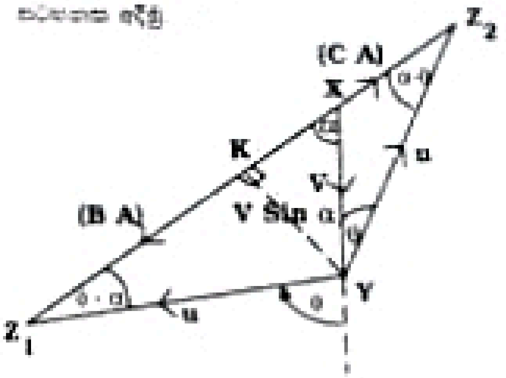
(C A) = (C E) + (C A)



$= \overrightarrow{XY} + \overrightarrow{YZ_2}$

$= \overrightarrow{XZ_2}$

(b) XYZ_1 [illegible] XYZ_2 [illegible]



(i) $XYZ_1\ \Delta$ [illegible]

$\frac{U}{\sin\alpha} = \frac{V}{\sin(\phi - \alpha)}$ — ①

[illegible] $XYZ_2\ \Delta$ [illegible]

$\frac{U}{\sin(\pi - \alpha)} = \frac{V}{\sin(\alpha - \theta)}$ — ②

① [illegible] ② [illegible]

$\frac{U}{\sin\alpha} = \frac{V}{\sin(\phi - \alpha)} = \frac{V}{\sin(\alpha - \theta)}$

(B C) = (B A) + (A C) [illegible]

$= \overrightarrow{XZ_1} + (-\overrightarrow{XZ_2})$

$= \overrightarrow{XZ_1} + \overrightarrow{Z_2X} = \overrightarrow{Z_2Z_1}$

$YZ_1Z_2\ \Delta$ [illegible] $Z_1Z_2 = 2(Z_1K)$

$= 2\sqrt{u^2 - V^2\sin^2\alpha}$ ($KYZ_1\ \Delta$ [illegible])

[illegible]
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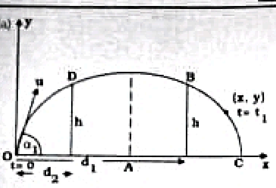
01. (a)



O [illegible] x, y [illegible]

$\rightarrow \quad x = u\cos\alpha_1 t_1$ ——— ①

$\uparrow \quad y = u\sin\alpha_1 t_1 - \frac{1}{2}gt_1^2$ ——— ②

① හා ② න් t_1 [illegible]

$y = x\tan\alpha_1 - \frac{gx^2}{2u^2}\sec^2\alpha_1$ ——— ③

③ [illegible]

$gx^2\sec^2\alpha_1 - 2u^2x\tan\alpha_1 + 2u^2y = 0$

[illegible] x හි [illegible]

y = h විට [illegible]

$x = d_1$ හා $x = d_2$ වේ. $\because D = (d_2, h)$, $B = (d_1, h)$

③ න් $x_1 + x_2 = \frac{2u^2\tan\alpha_1}{g\sec^2\alpha_1} = \frac{u^2}{g}\sin 2\alpha_1$

$= d_1 + d_2$ වේ. ——— ④

$x_1x_2 = \frac{2u^2h}{g\sec^2\alpha_1} = \frac{2hu^2}{g}\cos^2\alpha_1$

$= d_1d_2$ වේ.

$h \le \frac{u^2}{2g}\sin^2\alpha_1$ [illegible] d_1 හා d_2 [illegible]

[illegible] $x_1 = x_2 \Rightarrow d_1 = d_2$

එවිට ④ න් $2d_1 = \frac{u^2\sin 2\alpha_1}{g} \Rightarrow$

$d_1 = \frac{u^2\sin 2\alpha_1}{2g} = OA$

[illegible] α_2 විට Q [illegible] OA [illegible]

[illegible] OA $= \frac{u^2\sin 2\alpha_2}{2g}$ වේ.

එවිට $\frac{u^2\sin 2\alpha_1}{2g} = \frac{u^2\sin 2\alpha_2}{2g}$

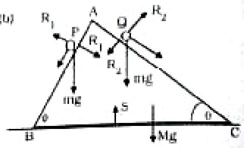
$\Rightarrow \sin 2\alpha_1 = \sin 2\alpha_2$

$\sin 2\alpha_1 = \sin(\pi - 2\alpha_2)$

$\Rightarrow 2\alpha_1 = \pi - 2\alpha_2 \Rightarrow \alpha_1 + \alpha_2 = \frac{\pi}{2}$

$(\because \alpha_1 < \frac{\pi}{2}$ හා $\alpha_2 < \frac{\pi}{2}$ නිසා$)$

(b)



(P ට) = a_1 (φ)

(Q ට) = a_2 (θ)

(ට E) = $\rightarrow f_1$

(P E) = (P ට) + (ට E)

= a_1 (φ) + $\rightarrow f_1$

(Q E) = a_2 (θ) + $\rightarrow f_1$

$\underline{F} = m\underline{a}$ [illegible]

P ↙ $mg\sin\phi = m(a_1 - f_1\cos\phi)$ ——— ①

Q ↘ $mg\sin\theta = m(a_2 + f_1\cos\theta)$ ——— ②

[illegible] $f_1 = 0$ [illegible]

① න් $a_1 = g\sin\phi$ ද ② න් $a_2 = g\sin\theta$ ද වේ.

[illegible] $\underline{F} = m\underline{a}$ [illegible]

$\rightarrow 0 = Mf_1 + m(f_1 + a_2\cos\theta) + m(f_1 - a_1\cos\phi)$ ——— ③

① න් $a_1 = g\sin\phi + f_1\cos\phi$ හා

② න් $a_2 = g\sin\theta - f_1\cos\theta$ නිසා

③ න් $0 = f_1(M + 2m) + m\cos\theta(g\sin\theta - f_1\cos\theta) - m\cos\phi(g\sin\phi + f_1\cos\phi)$

$mg(\sin\phi\cos\phi - \sin\theta\cos\theta) = f_1[M + 2m - m\cos^2\theta - m\cos^2\phi]$

$\frac{mg}{2}(\sin 2\phi - \sin 2\theta)$

$= f_1[M + m(1 - \cos^2\theta) + m(1 - \cos^2\phi)]$

$= f_1[M + m(\sin^2\theta + \sin^2\phi)]$

$f_1 = \frac{mg}{2}\frac{(\sin 2\phi - \sin 2\theta)}{[M + m(\sin^2\theta + \sin^2\phi)]}$

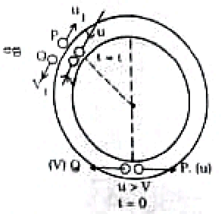
$\theta = \phi$ විට $2\theta = 2\phi$ නිසා

$\sin 2\phi - \sin 2\theta = 0$

$\therefore f = 0$ [illegible] P හා Q හි [illegible] ① හා ② න් $g\sin\phi$ හා $g\sin\theta$ [illegible]

02

[illegible]



(a) P හා Q [illegible] ω_1 හා ω_2 [illegible]

$\omega_1 = \frac{u}{a}$ හා $\omega_2 = \frac{v}{a}$ වේ.

t [illegible]

$\omega_1 t + \omega_2 t = 2\pi$ [illegible] 2π [illegible]

[illegible]

$t\left(\frac{u}{a} + \frac{v}{a}\right) = 2\pi$

$\underline{t = \frac{2\pi a}{u + v}}$

[illegible]

$mu - mv = mv_1 - mu_1$

$\Rightarrow u - v = v_1 - u_1$

[illegible]

$e(u + v) = v_1 + u_1$

[illegible]

$v_1 = \frac{e(u + v) + u - v}{2} > 0$

[illegible] Q [illegible]

$(\because u > v$ නිසා$)$

හා $u_1 = \frac{u(e - 1) + v(1 + e)}{2}$ වේ.

$u_1 > 0$ [illegible]

$u_1 = \frac{u(e - 1) + v(1 + e)}{2} > 0$ [illegible]

$e(u + v) > u - v \Rightarrow e > \frac{u - v}{u + v}$ [illegible]

[illegible] P හා Q [illegible]

$t = \frac{2\pi a}{u_1 + v_1}$ [illegible]

$e(u + v) = v_1 + u_1$ නිසා

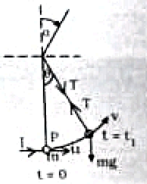
$t_1 = \frac{2\pi a}{e(u + v)}$

[illegible]

$= \frac{2\pi a}{u + v} + \frac{2\pi a}{e(u + v)}$

$= \underline{\frac{2\pi a}{(u + v)}\left(\frac{1 + e}{e}\right)}$

(b)



P හි [illegible] u [illegible]

$\rightarrow \quad I = \Delta(mv)$ [illegible]

$I = mu - m(0) \Rightarrow u = \frac{I}{m}$ (මෙය P හි [illegible])

[illegible]

t = 0 හා t = t_1 [illegible]

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

$v^2 = u^2 - 2ga(1 - \cos\theta) = \frac{I^2}{m^2} - 2ga + 2ga\cos\theta$

$\underline{F} = m\underline{a}$ [illegible]

$T - mg\cos\theta = m\frac{v^2}{a}$

$T = \frac{m}{a}[u^2 - 2ga + 2ga\cos\theta] + mg\cos\theta$

$= \frac{m}{a}\left[\frac{I^2}{m^2} - 2ga + 3ga\cos\theta\right]$

$T = \frac{I^2}{ma} - 2mg + 3mg\cos\theta$ ——— ②

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① න්

$V^2 = \frac{I^2}{m^2} - 2ga + 2ga\cos\theta$

[illegible] θ සඳහා $T > 0$ විය යුතුය.

එනම්, [illegible] $T > 0$ විය යුතුය.

$\frac{I^2}{ma} - 2mg - 3mg > 0$ (∵ [illegible] $\cos\theta = -1$)

$I^2 > 5m^2ga \Rightarrow I > m\sqrt{5ag}$

OP [illegible] α [illegible]

$\alpha = \pi - \theta \Rightarrow \theta = \pi - \alpha$

විට $T = 0$ වේ. එවිට ① න්

$0 = \frac{I^2}{ma} - 2mg + 3mg\cos(\pi - \alpha)$

$3mg\cos\alpha = \frac{I^2}{ma} - 2mg$

$\cos\alpha = \frac{I^2}{3m^2ag} - \frac{2}{3}$ වේ.

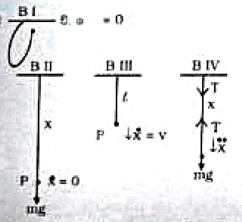
$0 < \alpha < \frac{\pi}{2}$ විට $0 < \cos\alpha < 1$ නිසා

$0 < \frac{I^2}{3m^2ag} - \frac{2}{3} < 1 \Rightarrow \frac{2}{3} < \frac{I^2}{3m^2ag} < \frac{2}{3} + 1$

$\frac{2}{3} < \frac{I^2}{3m^2ga} < \frac{5}{3} \Rightarrow 2m^2ga < I^2 < 5m^2ga$

$m\sqrt{2ga} < I < m\sqrt{5ga}$

04. (i) B I වී. ω = 0



I හා II [illegible]

$0 + 0 + 0 = 0 - mgx + \frac{1}{2} \times 4mg\frac{(x-\ell)^2}{\ell}$

$mgx = \frac{4mg}{2}\frac{(x-\ell)^2}{\ell}$

$x\ell = 2(x^2 - 2x\ell + \ell^2)$

$0 = 2x^2 - 5x\ell + 2\ell^2$

$0 = (2x - \ell)(x - 2\ell)$

$x = \frac{\ell}{2}$ හෝ $x = 2\ell$

$x > \ell$ නිසා [illegible] $= 2\ell$

I හා III [illegible]

$0 = \frac{1}{2}mv^2 - mg\ell$

$V^2 = 2g\ell$

$V = \sqrt{2g\ell}$

IV [illegible]

$T = \frac{4mg(x-\ell)}{\ell}$

$F = ma \downarrow$ [illegible]

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

$mg - \frac{4mg}{\ell}(x - \ell) = m\ddot{x}$

$\frac{-4g}{\ell}\left(x - \frac{5\ell}{4}\right) = \ddot{x}$ —— ①

$x - \frac{5\ell}{4} = y$ [illegible]

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

$-\frac{4g}{\ell}y = \ddot{y}$

① [illegible] $x \geq \ell$ විට.

එනම් $y + \frac{5\ell}{4} \geq \ell$ විට

එනම් $y \geq \frac{-\ell}{4}$ විට

$\ddot{y} + \frac{4g}{\ell}y = 0$ —— ②

[illegible]

[illegible] $\ddot{y} = 0$ වන

එනම් $y = 0$ වන

O සිට $\frac{5\ell}{4}$ [illegible]

[illegible]

[illegible]

$t = 0$ විට $y = -\frac{\ell}{4}$

හා $\dot{y} = \sqrt{2g\ell}$ වේ.

$y = A\cos\omega t + B\sin\omega t$ —— ③

[illegible]

$\dot{y} = -A\omega\sin\omega t + B\omega\cos\omega t$ —— ④

[illegible]

$\ddot{y} = -A\omega^2\cos\omega t - B\omega^2\sin\omega t$

$\ddot{y} = -\omega^2(A\cos\omega t + B\sin\omega t)$ —— ⑤

$\ddot{y} = -\omega^2 y$ —— ⑥

② හා ⑥ [illegible]

$\omega^2 = \frac{4g}{\ell} \Rightarrow \omega = 2\sqrt{\frac{g}{\ell}}$

$t = 0$ විට $y = -\frac{\ell}{4}$ හා $\dot{y} = \sqrt{2g\ell}$ නිසා

③ න් $-\frac{\ell}{4} = A(1) + B(0) \Rightarrow A = -\frac{\ell}{4}$

④ න් $\sqrt{2g\ell} = -A\omega(0) + B\omega(\cos 0)$

$B = \frac{\sqrt{2g\ell}}{\omega} = \frac{\sqrt{2g\ell}}{2\sqrt{g/\ell}} = \frac{1}{2}\sqrt{2g\ell \times \frac{\ell}{g}}$

$= \frac{\ell\sqrt{2}}{2} = \frac{\ell}{\sqrt{2}}$

එවිට $y = -\frac{\ell}{4}\cos\omega t + \frac{\ell}{\sqrt{2}}\sin\omega t$

$= \frac{3\ell}{4}\left(\frac{-\ell/4}{3\ell/4}\cos\omega t + \frac{\ell/\sqrt{2}}{3\ell/4}\sin\omega t\right)$

$= \frac{3\ell}{4}(-\sin\alpha\cos\omega t + \cos\alpha\sin\omega t)$

$= \frac{3\ell}{4}\sin(\omega t - \alpha)$

මෙහි $\tan\alpha = \frac{1}{2\sqrt{2}}$

y [illegible] $\sin(\omega t - \alpha) = 1$ විට.

∴ උපරිම $y = \frac{3\ell}{4}$

[illegible] උපරිම දිග $= \ell + \frac{\ell}{4} + \frac{3\ell}{4} = 2\ell$

$\dot{y} = \frac{\ell\omega}{4}\sin\omega t + \frac{\ell}{\sqrt{2}}\omega\cos\omega t$

$= \frac{\sqrt{g\ell}}{2}\sin\omega t + \sqrt{2g\ell}\cos\omega t$

$\dot{y} = \frac{3}{2}\sqrt{g\ell}(-\sin\alpha\sin\omega t + \cos\alpha\cos\omega t)$

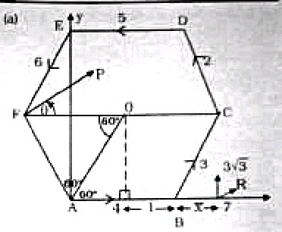
$\dot{y} = \frac{3}{2}\sqrt{g\ell}\cos(\omega t + \alpha)$

$\dot{y}$ උපරිම වන්නේ $\cos(\omega t + \alpha)$ උපරිම වන විට.

උපරිම $\cos(\omega t + \alpha) = 1$ නිසා

P හි උපරිම ප්‍රවේගය $= \frac{3\sqrt{g\ell}}{2}$

05. (a)



[illegible]

$R = 0$ හා $G \neq 0$ විට X හා Y [illegible]

[illegible] → $X = 4 + 3\cos 60 - 2\cos 60 - 5 - 6\cos 60 + P\cos\theta = 0$

එනම් $P\cos\theta = \frac{7}{2}$ හා ↑Y

$= 2\cos 30 + 3\cos 30 - 6\cos 30 + P\sin\theta = 0$

එනම්, $P\sin\theta = \frac{\sqrt{3}}{2}$ විය යුතුය.

$P^2\cos^2\theta + P^2\sin^2\theta = \frac{49}{4} + \frac{3}{4}$

$= \frac{52}{4} = 13 \Rightarrow P = \sqrt{13}$

හා $\tan\theta = \frac{\sqrt{3}}{7}$ විය යුතුයි.

එවිට O [illegible] G නම්.

$\curvearrowright G = (4 + 3 + 2 + 5 + 6)\, 2\sin 60 - P\sin\theta \times 2 + P\cos\theta \times 0$

$= 20 \times 2 \times \frac{\sqrt{3}}{2} - \frac{\sqrt{3}}{2} \times 2$

$= 19\sqrt{3}$

$P = 7$ හා $\theta = 120°$ විට

එවිට [illegible] AF [illegible]

$\overset{+}{\leftarrow} X = 4 + \left(3 \times \frac{1}{2}\right) - \left(2 \times \frac{1}{2}\right) - 5 - \left(6 \times \frac{1}{2}\right) - \left(7 \times \frac{1}{2}\right)$

$= -1 + \frac{1}{2}(3 - 2 - 6 - 7)$

$X = -7$ හා $Y = 3\sqrt{3}$

([illegible])

එවිට $R = \sqrt{X^2 + Y^2} = \sqrt{49 + 27}$

$= 2\sqrt{19} \neq 0$ නිසා [illegible]

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$\circlearrowleft$ O [illegible]

$(4 + 3 + 2 + 5 + 6 - 7)\, 2\sin 60$
$= 7 \times 2\sin 60 + 3\sqrt{3}\,(1 + \bar{x})$

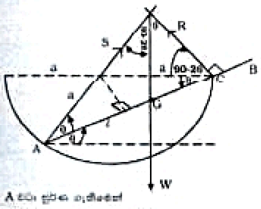
$\left(13 \times 2 \times \frac{\sqrt{3}}{2}\right) + \left(7 \times 2 \times \frac{\sqrt{3}}{2}\right)$

$= 3\sqrt{3} + 3\sqrt{3}\,\bar{x}$

$\bar{x} = \frac{17}{3}$

[illegible] AB [illegible] B [illegible] $5\frac{2}{3}$ m [illegible]

(b)



A [illegible]

$R \times AC = W \times \ell\cos\theta$
(R [illegible] AB [illegible])
$R \times 2a\cos\theta = W \times \ell\cos\theta$

$R = \frac{W\ell}{2a}$ ——— ①

[illegible]

$\frac{W}{\sin(90 - \theta)} = \frac{R}{\sin(90 + 2\theta)} \Rightarrow$

$R = \frac{W\cos 2\theta}{\cos\theta}$ ——— ②

① [illegible] ② [illegible] $\frac{W\ell}{2a} = \frac{W\cos 2\theta}{\cos\theta} \Rightarrow$

$2a\cos 2\theta = \ell\cos\theta$
$2a(2\cos^2\theta - 1) = \ell\cos\theta \Rightarrow 4a\cos^2\theta - \ell\cos\theta - 2a = 0$

$\cos\theta = \frac{\ell \pm \sqrt{\ell^2 + 32a^2}}{8a}$

$0 < \theta < \pi/2$ [illegible] $\cos\theta > 0$ [illegible]

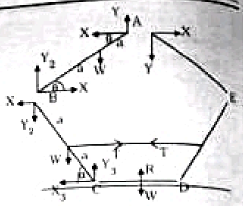
$\cos\theta = \frac{\ell + \sqrt{\ell^2 + 32a^2}}{8a}$

$CB = 2\ell - 2a\cos\theta$

$= 2\ell - 2a\left[\frac{\ell + \sqrt{\ell^2 + 32a^2}}{8a}\right]$

$= \frac{1}{4}\left[7\ell - \sqrt{\ell^2 + 32a^2}\right]$

06. (a)



$\theta = \frac{\pi}{5}$ [illegible] $\alpha = \frac{2\pi}{5}$ [illegible]

[illegible] A [illegible]

$Y = 0$ ——— ①
BA [illegible]

$B\circlearrowright$ $W \times a\cos\theta = X \times 2a\sin\theta$
$X = \frac{W}{2}\cot\theta$

AB, BC [illegible]

$C\circlearrowleft$ $(W \times a\cos\alpha) - (T \times a\sin\alpha) + X(2a\sin\alpha + 2a\sin\theta) - W(a\cos\theta - 2a\cos\alpha) = 0$

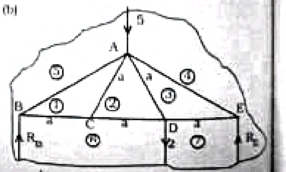
$W \times \cos\alpha - T\sin\alpha + \frac{W}{2}\cot\theta . 2\sin\alpha + \frac{W}{2}\cot\theta . 2\sin\theta - W\cos\theta + 2W\cos\alpha = 0$

$3W\cos\alpha + W\cos\theta + W\cot\theta\sin\alpha - W\cos\theta = T\sin\alpha$

$\frac{W(3\cos\alpha + \cot\theta\sin\alpha)}{\sin\alpha} = T$

$T = W(3\cot\alpha + \cot\theta)$
$= W(3\cot 2\pi/5 + \cot \pi/5)$

(b)



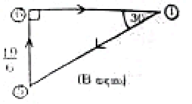
$\uparrow\ R_B + R_E = 7$

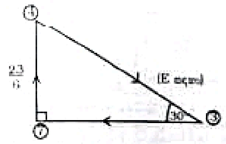
$B\circlearrowright$ $5 \times \frac{3a}{2} + (2 \times 2a) = R_E \times 3a$

$R_E = \frac{23}{6}$ N

$\therefore R_B = \frac{19}{6}$ N

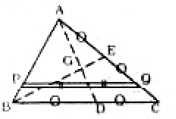
B [illegible] E [illegible]





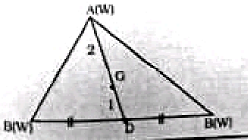
AB [illegible] 19/3 N
AE [illegible] 23/3 N

07



ABC [illegible] BC [illegible] AD [illegible] AD [illegible] AC [illegible] BE [illegible]

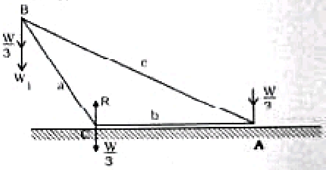
[illegible] G [illegible]



A, B [illegible] C [illegible] $\frac{W}{g}$ ([illegible] W) [illegible]

B [illegible] C [illegible] W [illegible] 2W, D [illegible] (BD = DC) [illegible]

[illegible] A [illegible] W [illegible] D [illegible] 2W [illegible] 3W, AG : GD = 2W : W = 2 : 1 [illegible] AD [illegible] G [illegible] A [illegible]



[illegible] W [illegible] A, B, C [illegible] $\frac{W}{3}$ [illegible]

[illegible] B [illegible] W_1 [illegible] CA [illegible] R [illegible] C [illegible]

C [illegible]

$\left(\frac{W}{3} + W_1\right) a\cos(180° - C) = \frac{W}{3} \times b$

$-a\left(\frac{W}{3} + W_1\right)\cos C = \frac{W}{3}\, b$

$a\left(\frac{W}{3} + W_1\right)\left(\frac{a^2 + b^2 - c^2}{2ab}\right) = \frac{W}{3}\, b$

$\left(\frac{W}{3} + W_1\right)\left(\frac{c^2 - a^2 - b^2}{2b}\right) = \frac{W}{3}\, b$

$\frac{W}{3} + W_1 = \frac{2b^2W}{3(c^2 - a^2 - b^2)}$

$W_1 = \frac{2b^2W}{3(c^2 - a^2 - b^2)} - \frac{W}{3}$

$= \frac{W}{3}\frac{(2b^2 - c^2 + a^2 + b^2)}{(c^2 - a^2 - b^2)}$

$W_1 = \frac{W}{3}\frac{(a^2 + 3b^2 - c^2)}{(c^2 - a^2 - b^2)}$

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08. (a) A හා B [illegible]

$P(A \cap B) = P(A)\,P(B)$ [illegible]

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

X	0	1
P(X)	a	a

Y	0	1
P(Y)	b	b

X, 0 හා 1 [illegible]

$a + a = 1$ [illegible]

[illegible] $a = \frac{1}{2}$ [illegible] $b = \frac{1}{2}$ [illegible]

$A : X = 0$ හා $\bar{A} : X = 1$ [illegible]

A හා $\bar{A}$ [illegible]

[illegible]

$u = X + Y$ [illegible]

$X = 0$ හා $Y = 0$ විට $u = 0$

$X = 1$ හා $Y = 0$ විට $u = 1$

$X = 0$ හා $Y = 1$ විට $u = 1$

$X = 1$ හා $Y = 1$ විට $u = 2$

A හා B [illegible] $\bar{A}$ හා $\bar{B}$ ද [illegible]

u	0	1	2
$P(u = u)$	$\frac{1}{2} \times \frac{1}{2} = \frac{1}{4}$	$\left(\frac{1}{2} \times \frac{1}{2}\right) + \left(\frac{1}{2} \times \frac{1}{2}\right) = \frac{1}{2}$	$\frac{1}{2} \times \frac{1}{2} = \frac{1}{4}$

$V = XY$ [illegible] $V = 0, 1$ [illegible]

V	0	1
$P(V = V)$	$\left(\frac{1}{2} \times \frac{1}{2}\right) + \left(\frac{1}{2} \times \frac{1}{2}\right) + \left(\frac{1}{2} \times \frac{1}{2}\right) = \frac{3}{4}$	$\left(\frac{1}{2} \times \frac{1}{2}\right) = \frac{1}{4}$

X	Y	
0	0	0
0	1	0
1	0	0
1	1	1

(b) $P(X/A) = 0.2$ හා $P(X/B) = 0.8$ [illegible]

$P(A) = \frac{40}{100} = 0.4$ හා $P(B) = \frac{60}{100} = 0.6$

[illegible]

X [illegible] $P(X)$

$= P(X/A)\,P(A) + P(X/B)\,P(B)$

([illegible])

$= 0.2 \times 0.4 + 0.8 \times 0.6$

$= 0.08 + 0.48$

$= \underline{0.56}$

X [illegible] B [illegible]

$$P(B/X) = \frac{P(X/B)\,P(B)}{P(X/A)\,P(A) + P(X/B)\,P(B)}$$

([illegible])

$$\therefore P(B/X) = \frac{0.8 \times 0.6}{0.56} = \frac{0.48}{0.56}$$

$$= \frac{6}{7}$$

$P(B/X) > P(B)$ [illegible] X [illegible] B [illegible] B [illegible]

[illegible] $(p(A|X) = \frac{1}{7} < p(A) = 0.4$ [illegible] A [illegible]

09. [illegible] $x_1, x_2, \ldots\ldots x_n$ [illegible]

$$[illegible] = \frac{x_1 + x_2 + \ldots\ldots + x_n}{n}$$

[illegible]

[illegible]

$$S^2 = \frac{1}{N}\left\{\sum_{i=1}^{N} x_i^2 - \frac{1}{N}\left[\sum_{i=1}^{N} x_i\right]^2\right\}$$

$\bar{x}$ [illegible]

$$\sum_{i=1}^{N} d_i = 0 \text{ [illegible]}$$

$$S^2 = \frac{1}{N}\left\{\sum_{i=1}^{N} (\bar{x} + d_i)^2 - \frac{1}{N}\left[\sum_{i=1}^{N} (\bar{x} + d_i)\right]^2\right\}$$

$[\because d_i = x_i - \bar{x}]$

$$= \frac{1}{N}\left\{\sum_{i=1}^{N} (\bar{x}^2 + 2\bar{x}d_i + d_i^2) - \frac{1}{N}\left[\sum_{i=1}^{N} \bar{x} + \sum_{i=1}^{N} d_i\right]^2\right\}$$

$$= \frac{1}{N}\left\{\sum_{i=1}^{N} \bar{x}^2 + 2\bar{x}\sum_{i=1}^{N} d_i + \sum_{i=1}^{N} d_i^2 - \frac{1}{N}[N\bar{x}]^2\right\}$$

$$= \frac{1}{N}\left\{N\bar{x}^2 + \sum_{i=1}^{N} d_i^2 - N\bar{x}^2\right\}$$

$$= \frac{1}{N}\sum_{i=1}^{N} d_i^2$$

$x_1 \le x_2 \le x_3 \le x_4 \le x_5$ [illegible]

[illegible] 31 [illegible]

$x_1 = 31 \neq x_2$ [illegible]

[illegible] 36 [illegible] $x_3 = 36$

[illegible]

$x_1 \neq x_2$ [illegible]

[illegible] x_4 හා x_5 [illegible] $\therefore x_4 = x_5$

[illegible] 35 [illegible]

$$\frac{x_1 + x_2 + x_3 + x_4 + x_5}{5} = 35$$

$$\therefore x_1 + x_2 + x_3 + x_4 + x_5 = 175$$

$$x_2 + x_4 + x_5 = 175 - 31 - 36$$

$$x_2 + 2x_4 = 108 \; (\because x_4 = x_5 \text{ [illegible]})$$

$31 < x_2 < 36$ හා $x_4, x_5 > 36$ [illegible]

[illegible]

$x_2 = 34$ [illegible] $x_4 = x_5 = 37$

$x_2 = 32$ [illegible] $x_4 = x_5 = 38$

[illegible] I 31, 32, 36, 38, 38 [illegible]

II 31, 34, 36, 37, 37 [illegible]

$S^2 = 5.2$ [illegible]

I [illegible] $d_i = -4, -3, 1, 3, 3;$

$$S^2 = \frac{1}{5}(4 + 9 + 1 + 9 + 9)$$

$$= 6.4 \neq 5.2$$

II [illegible] $d_i = -4, -1, 1, 2, 2;$

$$S^2 = \frac{1}{5}(16 + 1 + 1 + 4 + 4)$$

$$= 5.2$$

[illegible] $= 31, 34, 36, 37, 37$

[illegible]

$$= \frac{3\,([illegible] - [illegible])}{[illegible]}$$

$$= \frac{3\,(35 - 36)}{\sqrt{5.2}} = \frac{-3}{2.28} = -1.31$$

$\bar{x} = \frac{1}{N}\sum x_i$

$y_i = 55 - x_i$ [illegible]

$$\bar{y} = \frac{1}{N}\sum_{i=1}^{N} y_i = \frac{1}{N}\sum_{i=1}^{N}(55 - x_i)$$

$$\bar{y} = \frac{1}{N}\left(N \times 55 - \sum_{i=1}^{N} x_i\right)$$

$$\bar{y} = 55 - \frac{1}{N}\sum_{i=1}^{N} x_i$$

$$\bar{y} = 55 - \bar{x}$$

x_i	31	34	36	37	37
$Y_i = 55 - x_i$	24	21	19	18	18

$\bar{y} = 55 - 35 \; (\because \bar{x} = 35$ [illegible]$)$

$= 20$

$d_i = y_i - \bar{y}$ [illegible] d_i 4 1 -1 -2 2

[illegible] $d_i = x_i - \bar{x}$ [illegible] $-d_i$ [illegible]

[illegible] $S_y^2 = 5.2$ [illegible] (d_i^2 [illegible])

[illegible]

$$= \frac{3(20 - 19)}{\sqrt{5.2}}$$

$= 1.31$ [illegible]

*** ***

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