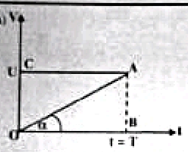
01. (a)



[illegible] $t = T$ [illegible] U [illegible].

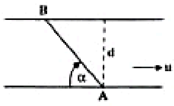
$\therefore$ [illegible] $= \tan\alpha = \frac{U}{T}$

[illegible] OAC Δ

$= \frac{1}{2} UT$ m

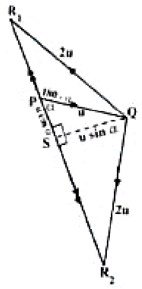
(b) (ජ E) $= \rightarrow u$
(පී ජ) $= 2u$

A → B ට [illegible]



(පී E) $=$ [illegible]
(පී E) $=$ (පී ජ) + (ජ E)

$= 2u + \rightarrow u$
$= u + 2u$
$= \overrightarrow{PQ} + \overrightarrow{QR_1}$
$= \overrightarrow{PR_1}$



B → A ට [illegible]

(පී E) $=$ [illegible]
$= 2u + \rightarrow u$
$= u + 2u$
$= \overrightarrow{PQ} + \overrightarrow{QR_2}$
$= \overrightarrow{PR_2}$

(i) A සිට B ට [illegible] B සිට A ට [illegible]

[illegible] $|\overrightarrow{PR_2}| = 2|\overrightarrow{PR_1}|$ [illegible] —— ①

$\left(\because \frac{AB}{|\overrightarrow{PR_1}|} = 2\frac{AB}{|\overrightarrow{PR_2}|} \right)$

$|\overrightarrow{PR_1}| = \sqrt{4u^2 - u^2\sin^2\alpha} - u\cos\alpha$ —— ②

$|\overrightarrow{PR_2}| = \sqrt{4u^2 - u^2\sin^2\alpha} + u\cos\alpha$

① ට අනුව

$\sqrt{4u^2 - u^2\sin^2\alpha} + u\cos\alpha = 2\left[\sqrt{4u^2 - u^2\sin^2\alpha} - u\cos\alpha\right]$

$3u\cos\alpha = \sqrt{4u^2 - u^2\sin^2\alpha}$

$9u^2\cos^2\alpha = u^2(4 - \sin^2\alpha)$

$9(1 - \sin^2\alpha) = 4 - \sin^2\alpha$

$5 = 8\sin^2\alpha$

$\therefore \sin\alpha = \sqrt{\frac{5}{8}}$ ($\alpha < \pi/2$ නිසා)

(ii) $|\overrightarrow{PR_1}| = \sqrt{4u^2 - u^2\frac{5}{8}} - u\sqrt{\frac{3}{8}}$ (② න්)

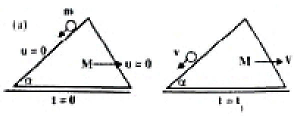
$\sqrt{\frac{27u^2}{8}} - u\sqrt{\frac{3}{8}} = \frac{3\sqrt{3}}{\sqrt{8}}u - \frac{\sqrt{3}u}{\sqrt{8}} = \frac{2\sqrt{3}}{8} = \sqrt{\frac{3}{2}}u$

A → B ට කාලය 2t නම් [illegible] කාලය 3t වේ.

$2t = \frac{d\,\mathrm{cosec}\,\alpha}{|\overrightarrow{PR_1}|} \Rightarrow 2t = d\sqrt{\frac{8}{5}} \Big/ \sqrt{\frac{3}{2}}u$ (II [illegible])

$\therefore 3t = \frac{3}{2}\sqrt{\frac{8}{5}} \times \sqrt{\frac{2}{3}}\frac{d}{u} = \frac{6d}{u\sqrt{15}}$

02. (a)



(ත E) $= \rightarrow V$

(අ ත) $=$ [illegible]

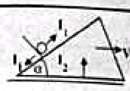
(අ E) $=$ [illegible] $+ \rightarrow V =$ [illegible] $V - u\cos\alpha$, $u\sin\alpha$

[illegible] ($t = 0$ [illegible] $t = t_1$) [illegible]

$\rightarrow \quad 0 = MV + m(V - u\cos\alpha)$

$\frac{m\,u\cos\alpha}{M + m} = V$

[illegible] V_1 [illegible]



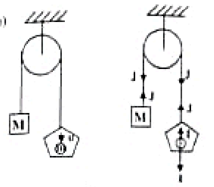
$0 = (M + m)V_1 \Rightarrow V_1 = 0$ [illegible]

[illegible] I_2 නම්

$I = \Delta(mv)$ [illegible] $I_2 = (M + m)0 - [M\times0 + m(-u\sin\alpha)]$

$I_2 = mu\sin\alpha$

(b)



[illegible] $\uparrow V_1$ [illegible] $\downarrow V_2$ [illegible]

[illegible] J [illegible] I [illegible]

$\therefore$ (බෝ බි) $= \uparrow V_1 = eu$ වේ

(බෝ E) $=$ (බෝ බි) + (බි E)

$= \uparrow eu + \downarrow V_2 = \uparrow(eu - V_2)$

$I = \Delta(mV)$

බෝලයට $\uparrow I = m(eu - V_2) - m(-u)$

$I = mu(1 + e) - mV_2$ —— ①

[illegible] $\uparrow J - I = M(-V_2)$ —— ②

[illegible] $\uparrow J = MV_2$ —— ③

① + ② $\quad J = mu(1 + e) - V_2(M + m)$ —— ④

③ = ④ $\quad MV_2 = mu(1 + e) - V_2(M + m)$

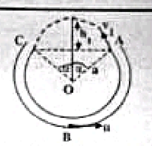
$\therefore V_2 = \frac{mu(1 + e)}{2M + m}$

[illegible] $J = \frac{M\,mu(1 + e)}{2M + m}$; ③ න්

[illegible] 0 ද වේ. $s = ut + \frac{1}{2}at^2$ [illegible] $s = 0, u = eu, a = -g, t = t_1$ නම්

$0 = eut_1 - \frac{1}{2}gt_1^2 \Rightarrow t_1 = \frac{2eu}{g}$

03.



[illegible] A [illegible] V_1 [illegible]

$AC = 2a\sin\alpha$

B සිට A [illegible]

$\frac{1}{2}mu^2 - mga = \frac{1}{2}mV_1^2 + mga\cos\alpha$

$V_1^2 = u^2 - 2ga(1 + \cos\alpha)$ —— ①

A → C චලිතය සලකා

$S = ut + \frac{1}{2}at^2$ [illegible]

$\uparrow \quad S = 0, u = V_1\sin\alpha, a = -g, t = t_1$

$0 = V_1\sin\alpha\, t_1 - \frac{1}{2}gt_1^2$

$t_1 \neq 0$ නිසා $\quad t_1 = \frac{2V_1\sin\alpha}{g}$ —— ②

$\rightarrow \quad S = 2a\sin\alpha, U = V_1\cos\alpha, t = t_1, a = 0$

$2a\sin\alpha = V_1\cos\alpha\,\frac{2V_1\sin\alpha}{g}$; ② න්

$\frac{ag}{\cos\alpha} = V_1^2$ —— ③

① හා ③ න් $\frac{ag}{\cos\alpha} = u^2 - 2ga(1 + \cos\alpha)$

$ag\sec\alpha + 2ga(1 + \cos\alpha) = u^2$

$ga[2(1 + \cos\alpha) + \sec\alpha] = u^2$

A සිට [illegible] $v^2 = u^2 + 2as$ [illegible]

$v = 0, u_2 = V_1\sin\alpha, a = -g, s = h_1$ නම්

$0 = V_1^2\sin^2\alpha - 2gh_1 \Rightarrow h_1 = \frac{V_1^2\sin^2\alpha}{2g}$

0 සිට උස

$= h_1 + a\cos\alpha$

$= \frac{ag\sin^2\alpha}{\cos\alpha\times2g} + a\cos\alpha = \frac{a g(\sin^2\alpha + 2\cos^2\alpha)}{2g\cos\alpha}$

$= \frac{a(\sin^2\alpha + \cos^2\alpha + \cos^2\alpha)}{2\cos\alpha}$

$= \frac{a}{2}\frac{(1 + \cos^2\alpha)}{\cos\alpha} = \frac{a}{2}(\sec\alpha + \cos\alpha)$

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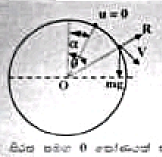
(ii)



OP ලම්බ සිරස සමග θ කෝණයක් සාදන විට අංශුවේ කෝණික වේගය $\dot{\theta}$ ද ප්‍රවේගය v නම් $v = a\dot{\theta}$ ද වේ. ශක්ති සංස්ථිති නියමය යෙදීමෙන්

$0 + mg\,a\cos\alpha = \frac{1}{2}m(a\dot{\theta})^2 + mg\,a\cos\theta$

$2mg\,a\cos\alpha = ma^2\dot{\theta}^2 + 2mga\cos\theta$

$2g(\cos\alpha - \cos\theta) = a\dot{\theta}^2$

$F = ma$ ↙ යෙදීමෙන්

$mg\cos\theta - R = ma\dot{\theta}^2$

$R = mg\cos\theta - m.2g(\cos\alpha - \cos\theta)$

$R = mg(3\cos\theta - 2\cos\alpha)$

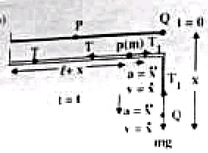
අංශුව ගෝලය අතහැර යයි නම් R = 0 වේ

එවිට $\theta = \theta_1$ නම්

$\cos\theta_1 = \frac{2}{3}\cos\alpha$

$\theta_1 = \cos^{-1}(\frac{2}{3}\cos\alpha)$ වේ

(b)



P හා Q වේග $\dot{x}$ ද, ත්වරණය $\ddot{x}$ මගින් ද වේ. ශක්ති සංස්ථිති මූලධර්මය යෙදීමෙන්

$0 = \frac{1}{2}m\dot{x}^2 + \frac{1}{2}m\dot{x}^2 - mgx + \frac{1}{2}mg\frac{x^2}{\ell}$

$2m\dot{x}^2 = 2mgx - mg\frac{x^2}{\ell}$

$2\dot{x}^2 = \frac{g}{\ell}[2\ell x - x^2]$

$\dot{x}^2 = \frac{g}{2\ell}[\ell^2 - (\ell - x)^2]$

$\dot{x}^2 = \omega^2[\ell^2 - (\ell - x)^2]$ —— ①

t විෂයෙන් අවකලනයෙන්

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

$\ddot{x} = \omega^2(\ell - x)$

$\ddot{x} = -\omega^2(x - \ell)$

මෙය සරල අනුවර්තී චලිතයක් වේ ∴ චලිතය සරල අනුවර්තී වේ. කේන්ද්‍රය $\ddot{x} = 0$ වන O සිට $x = 2\ell$ දුරකින් ය. විස්තාරය ① ට අනුව $\dot{x} = 0$ වන විට

① න් $x^2 - 2x\ell = 0$ එනම් $x = 2\ell$ විට

මෙය මුල ඇරඹීමේ O සිට මැනීමේ විස්තාරය ℓ වේ. අනුව චලිතය ආරම්භයේ P අංශුව මේසය දාරයට ළඟාවීමට ගත

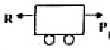
කරන කාලය $t_1 = \frac{\frac{\pi}{2}}{\omega} = \frac{\frac{\pi}{2}}{\sqrt{\frac{g}{2\ell}}} = \pi\sqrt{\frac{\ell}{2g}}$

මේස දාරය පසු ස. අ. ච. සමීකරණ ඇසුරින්

$v^2 = \omega^2(\ell^2 - y^2)$ න් $y = 0$ විට $v^2 = \frac{g}{2\ell}(\ell^2 - 0) = \frac{g}{2}\ell$

$\therefore v = \sqrt{\frac{g\ell}{2}}$

04. (a) $160\ \text{km h}^{-1} = \frac{400}{9}\ \text{ms}^{-1}$



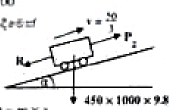
$P_1 = \frac{3000 \times 1000}{400/9}$ N

$F = mg$ යෙදීමෙන්

$P_1 - R = m \times 0$

$3000 \times 1000 \times \frac{9}{400} = R \Rightarrow R = 67500$ N

$F = m\underline{a}$ යෙදීමෙන්



$P_2 - R - mg\sin\alpha = m \times a_1$

$P_2 = \frac{3000 \times 1000}{50/3}$ N

$3000 \times 1000 \times \frac{3}{50} - 67500 - 450 \times 1000 \times 9.8 \times \frac{1}{70}$

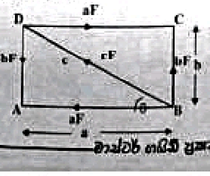
$= 450 \times 1000 \times a_1$

$1800 - 675 - 4500 \times \frac{98}{700} = 4500\,a_1$

$495 = 4500\,a_1$

$a_1 = 0.11\ \text{ms}^{-2}$

05. (a) බල විභේදනයෙන්



$\overrightarrow{X} = aF - aF - cF\cos\theta$

$= -cF\frac{a}{c}$

$= -aF$

$\uparrow Y = bF - bF + cF\sin\theta$

$= cF\frac{b}{c}$

$= bF$

සම්ප්‍රයුක්තය $R = \sqrt{X^2 + Y^2}$

$= F\sqrt{a^2 + b^2}$

$= Fc$

සම්ප්‍රයුක්ත බලය AB සමග α කෝණයක් සාදයි නම්,

$\tan\alpha = \frac{bF}{-aF} = \frac{-b}{a} = -\tan\theta = \tan(180 - \theta)$

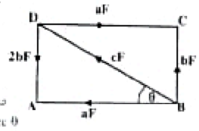
∴ BD දිශාවට වේ

B වටා ඝූර්ණයන්ගේ ඝූර්ණය ↶ $= aF \times b - bF \times a$

$= 0$

∴ සම්ප්‍රයුක්තය $\overrightarrow{BD}$ දිගේ පිහිටයි.

නව බල පද්ධතිය විභේදනයෙන්



$X = -aF$ මෙනෙයකින්ම

$\uparrow Y = -2bF + bF + cF\sec\theta$

$= -bF + cF\frac{b}{c}$

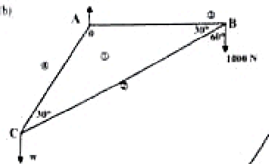
$= 0$

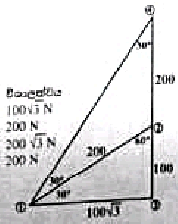
∴ සම්ප්‍රයුක්තය B සිට A දෙසට aF වේ

D වටා ඝූර්ණයන්ගේ ඝූර්ණය ↶ $= bF \times a - aF \times b = 0$

∴ නව සම්ප්‍රයුක්තය $\overrightarrow{CD}$ දිගේ aF වෙයි

(b)





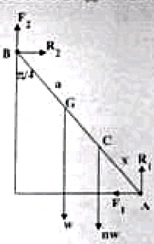
දණ්ඩ	ප්‍රත්‍යාබලය	විශාලත්වය
AB	ආතතිය	$100\sqrt{3}$ N
BC	තෙරපුම	200 N
AC	ආතතිය	$200\sqrt{3}$ N
	W	200 N

06. බල්ලට A සිට x දුරක් ඇති C හි මිනිසෙක් යයි සිතමු. A හා B ලක්ෂ්‍ය දෙකෙහිදීම සීමාකාරී සමතුලිතතාවයෙහි ඇත.

$\therefore F_1 = \mu R_1$ —— ①

$F_2 = \mu R_2$ —— ②

ඉණිමගේ සමතුලිතතාවය සලකා



A ↶

$nW x\frac{1}{\sqrt{2}} + W.a\frac{1}{\sqrt{2}} - F_2\,2a\frac{1}{\sqrt{2}} - R_2\,2a\frac{1}{\sqrt{2}} = 0$ —— ③

② න් $\frac{W}{\sqrt{2}}(nx + a) = 2a\frac{R_2}{\sqrt{2}}(\mu + 1)$

$\therefore R_2 = \frac{W(nx + a)}{2a(\mu + 1)}$ —— ④

→ $F_1 = R_2$ —— ⑤

↑ $F_2 + R_1 = W + nW$ —— ⑥

⑥ න් $R_1 = W(1 + n) - F_2$ —— ⑦

④ න් $F_2 = \frac{\mu W(nx + a)}{2a(\mu + 1)}$

⑦ න් $R_1 = W(1 + n) - \frac{\mu W(nx + a)}{2a(\mu + 1)}$

$R_1 = \frac{W[2a(1+n)(1+\mu) - \mu(nx + a)]}{2a(\mu + 1)}$

① න් $\frac{W(nx + a)}{2a(\mu + 1)} = \mu W\frac{[2a(1+n)(1+\mu) - \mu(nx + a)]}{2a(\mu + 1)}$

$nx + a = \mu 2a(1+n)(1+\mu) - \mu^2(nx + a)$

$nx + \mu^2 nx = \mu 2a[1 + \mu + n + n\mu] - \mu^2 a - a$

$= 2\mu a + 2\mu^2 a + 2\mu na + 2\mu^2 na - \mu^2 a - a$

$nx(1 + \mu^2) = a[2\mu^2 n + \mu^2 + 2\mu n + 2\mu - 1]$

$= a[\mu^2(2n+1) + 2\mu(n+1) - 1]$

$\therefore x = \frac{a}{n(1 + \mu^2)}[\mu^2(2n+1) + 2\mu(n+1) - 1]$

$\mu = \frac{1}{2}$ විට

$x = \frac{a}{n(1 + \frac{1}{4})}\{\frac{1}{4}(1 + 2n) + 1 + n - 1\}$

$= \frac{4a}{5n}\{\frac{1}{4} + \frac{6n}{4}\}$

$= \frac{a}{5n}(1 + 6n)$

[illegible] $x > 2a$ [illegible]

[illegible] $\frac{a}{3n}(1+6n) > 2a$ [illegible]

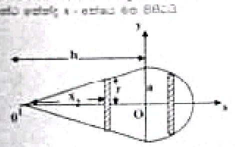
$1 + 6n > 10n$

$1 > 4n$

$n < \frac{1}{4}$ [illegible]

$n = \frac{1}{4}$ [illegible]

07. [illegible]
[illegible] x - [illegible]



(i) [illegible] y [illegible] x_1 [illegible]
[illegible] δx_1 [illegible]

[illegible] $= \pi(a^2 - x_1^2)\,\delta x_1$

[illegible] ρ [illegible]
[illegible] $= \pi(a^2 - x_1^2)\,\delta x_1\,\rho$

[illegible]
y [illegible] $= x_1$
[illegible] $(\bar{x}, 0)$ [illegible]

$$\bar{x} = \frac{\int_0^a \pi(a^2 - x_1^2)\,dx_1\,\rho \times x_1}{\int_0^a \pi(a^2 - x_1^2)\,dx_1\,\rho}$$

$$= \frac{\rho\pi\left[\frac{a^2x_1^2}{2}\right]_0^a - \rho\pi\left[\frac{x_1^4}{4}\right]_0^a}{\rho\pi[a^2x_1]_0^a - \rho\pi\left[\frac{x_1^3}{3}\right]_0^a}$$

$$= \frac{\frac{a^4}{2} - \frac{a^4}{4}}{a^3 - \frac{a^3}{3}} = \frac{3a}{8}$$

$\therefore$ [illegible] $= \left(\frac{3a}{8}, 0\right)$

(ii) [illegible] 0^1 [illegible]
[illegible] $\bar{\bar{X}}$ [illegible] 0^1 [illegible] x_2 [illegible] δx_2
[illegible] r [illegible]

[illegible] Δ [illegible] $\frac{x_2}{r} = \frac{h}{a} \Rightarrow r = \frac{ax_2}{h}$

[illegible] $= \pi r^2 \delta x_2 \rho$

$$= \pi\frac{a^2x_2^2}{h^2}\,\delta x_2\,\rho$$

[illegible] 0^1 [illegible] $= x_2$

$$\bar{\bar{x}} = \frac{\int_0^h \frac{\pi a^2 x_2^2}{h^2}\,dx_2\,\rho \times x_2}{\int_0^h \frac{\pi a^2 x_2^2}{h^2}\,dx_2\,\rho}$$

$$\bar{\bar{x}} = \frac{\frac{\pi a^2}{h^2}\int_0^h x_2^3\,dx_2}{\frac{\pi a^2}{h^2}\int_0^h x_2^2\,dx_2} = \frac{\left[\frac{x_2^4}{4}\right]_0^h}{\left[\frac{x_2^3}{3}\right]_0^h} = \frac{3h}{4}$$

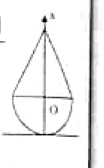
$\therefore$ O [illegible] $= h - \frac{3h}{4} = \frac{h}{4}$

[illegible] $= \left(-\frac{h}{4}, 0\right)$ [illegible]

[illegible] O [illegible] x_3 [illegible]

[illegible]

$$x_3 = \frac{\frac{1}{3}\pi a^2 h\rho\,\frac{h}{4} + \frac{2}{3}\pi a^3\rho\left(-\frac{3}{8}a\right)}{\frac{1}{3}\pi a^2 h\rho + \frac{2}{3}\pi a^3\rho}$$



$$= \frac{\frac{1}{3}\pi a^2\rho\left(\frac{h^2}{4} - \frac{3}{4}a^2\right)}{\frac{1}{3}\pi a^2\rho\,(h + 2a)} = \frac{h^2 - 3a^2}{4(h+2a)}$$

$\therefore x_3 = \frac{h^2 - 3a^2}{4(h+2a)}$ $(h^2 \geq 3a^2$ [illegible]$)$

[illegible] $x_3 > 0$ [illegible] $h^2 > 3a^2 \Rightarrow h > \sqrt{3}a$
[illegible] $h = \sqrt{3}a$ [illegible]
[illegible]

08. (a) x [illegible] y [illegible] $X \cup Y$ [illegible]
[illegible]
[illegible] $P(X \cup Y) = P(s) = 1$ [illegible]
X [illegible] Y [illegible]
[illegible]
$X \cap Y = \varnothing$ [illegible]
[illegible] $P(X \cap Y) = p(\varnothing) = 0$ [illegible]
X [illegible] Y [illegible]
[illegible]

[illegible] $P(X \cap Y) = P(X) \times P(Y)$

A [illegible] B [illegible]
[illegible]

$P(A) + P(B) = 1$ [illegible]

$P(A \cap B) = 0$ [illegible]

$P(A) \frac{2}{5} =$ [illegible] $P(B) = \frac{3}{5}$ [illegible]

A [illegible] C [illegible] $P(C) = \frac{1}{2}$ [illegible]

(i) $P(A \cap C) = P(A) \cdot P(C)$

$= \frac{2}{5} \times \frac{1}{2}$

$= \frac{1}{5}$

(ii) $P(A \cup C) = P(A) + P(C) - P(A \cap C)$

$= \frac{2}{5} + \frac{1}{2} - \frac{1}{5}$

$= \frac{7}{10}$

$(A \cup C)$ [illegible] $\overline{(A \cup C)}$ [illegible]
[illegible] $\overline{A \cup C} = \bar{A} \cap \bar{C}$ [illegible]

$P(\bar{A} \cap \bar{C}) = 1 - P(A \cup C)$

$= 1 - \frac{7}{10}$

$= \frac{3}{10}$

(iii) $P(A) = \frac{2}{5}$ [illegible] $P(\bar{A}) = 1 - \frac{2}{5} = \frac{3}{5}$ [illegible]

$P(C) = \frac{1}{2}$ [illegible] $P(\bar{C}) = 1 - \frac{1}{2} = \frac{1}{2}$ [illegible]

$P(\bar{A})\,P(\bar{C}) = \frac{3}{5} \times \frac{1}{2} = \frac{3}{10} = P(\bar{A} \cap \bar{C})$ [illegible] $\bar{A}$ [illegible] $\bar{C}$ [illegible]

$P(D) = \frac{1}{5}$ [illegible] $P(\bar{D}) = 1 - P(D) = 1 - \frac{1}{5} = \frac{4}{5}$

B [illegible] D [illegible]
$P(B \cup D) = P(B) + P(D)$ [illegible]

$P(B \cup D) = \frac{3}{5} + \frac{1}{5} = \frac{4}{5}$

$B \cup D$ [illegible] $\overline{B \cup D}$ $(\bar{B} \cap \bar{D})$ [illegible]
[illegible]

$P(\overline{B \cup D}) = P(\bar{B} \cap \bar{D}) = 1 - P(B \cup D) = 1 - \frac{4}{5} = \frac{1}{5} \neq 0$

[illegible] $\bar{B}$ [illegible] $\bar{D}$ [illegible]

(b) C : [illegible]
B : [illegible]
T : [illegible]
L : [illegible]
[illegible]

$P(C) = \frac{1}{10}$; $P(B) = \frac{2}{5}$; $P(T) = \frac{1}{2}$

$P(L/C) = \frac{1}{5}$, $P(L/B) = \frac{1}{2}$ $P(L/T) = \frac{3}{10}$ [illegible]
[illegible]

$$P(T/L) = \frac{P(L/T)\,P(T)}{P(L/C)\,P(C) + P(L/B)\,P(B) + P(L/T)\,P(T)}$$

$$= \frac{\frac{3}{10} \times \frac{1}{2}}{\left(\frac{1}{5} \times \frac{1}{10}\right) + \left(\frac{1}{2} \times \frac{2}{5}\right) + \left(\frac{3}{10} \times \frac{1}{2}\right)} = \frac{\frac{3}{20}}{\frac{1}{50} + \frac{2}{10} + \frac{3}{20}}$$

$= \frac{15}{37}$

09 (a) $\{x_1, x_2, \ldots, x_n\}$ [illegible] $\mu = \frac{1}{n}\sum_{i=1}^{n} x_i$
[illegible] $\sigma = \sqrt{\frac{1}{n}\sum_{i=1}^{n}(x_i - \mu)^2}$

(i) $\{x_1 + \alpha, x_2 + \alpha, \ldots, x_n + \alpha\}$

[illegible] $= \frac{1}{n}\sum_{i=1}^{n}(x_i + \alpha) = \frac{1}{n}\sum_{i=1}^{n} x_i + \frac{1}{n}\sum_{i=1}^{n}\alpha$

$= \mu + \frac{1}{n}n\alpha = \mu + \alpha$ (α [illegible])

[illegible] $= \frac{1}{n}\sum_{i=1}^{n}[x_i + \alpha - (\mu + \alpha)]^2$

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

[illegible] $= \sqrt{\frac{1}{n}\sum_{i=1}^{n}(x_i - \mu)^2} = \sigma$

(ii) $\{\beta x_1, \beta x_2, \ldots, \beta x_n\}$

[illegible] $= \frac{1}{n}\sum_{i=1}^{n}\beta x_i$

$= \frac{\beta}{n}\sum_{i=1}^{n} x_i$ (β [illegible])

$= \beta\mu$

[illegible] $= \frac{1}{n}\sum_{i=1}^{n}(\beta x_i - \beta\mu)^2$

$= \frac{1}{n}\sum_{i=1}^{n}\beta^2(x_i - \mu)^2$ (β [illegible])

$= \beta^2\sigma^2$

$\therefore$ [illegible] $= \beta\sigma$

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$\{2x_1+3\ ,\ 2x_2+3, \ldots 2x_n+3\}$ කුලකයේ සඳහා

මධ්‍යන්‍යය $\mu\ = \frac{1}{n}\sum_{i=1}^{n}(2x_i+3) = \frac{1}{n}\sum_{i=1}^{n} 2x_i + \frac{1}{n}\sum_{i=1}^{n} 3$

$= 2\frac{1}{n}\sum_{i=1}^{n} x_i + \frac{1}{n}\ 3n$

$= 2\mu + 3$

විචලතාව $\sigma^2 \ = \frac{1}{n}\sum_{i=1}^{n} \{2x_i + 3 - (2\mu+3)\}^2$

$= \frac{1}{n}\sum_{i=1}^{n} \{2x_i + \cancel{3} - 2\mu - \cancel{3}\}^2$

$= \frac{1}{n}4\sum_{i=1}^{n} (x_i - \mu)^2 = 4\sigma^2$

$\therefore$ සම්මත අපගමනය $= 2\sigma$

(b) (i) 3, 6, 9, 12, 4, 6, 8, 10, 12, 14, x, y
3, 4, 6, 6, 8, 9, 10, 12, 12, 14, x, y

මධ්‍යන්‍යය $= \frac{3+4+6+6+8+9+10+12+12+14+x+y}{12}$

$= \frac{84+x+y}{12} \quad = 8$ නිසා

$x + y = 12$

මාතය 6 නිසා x හා y අගයන් එකක් 6 විය යුතුය.
(∵ 12 ඇති දත්තයද ... නොවිය යුතු නිසා)
$\therefore\ x = y = 6$

(ii) 3, 4, 6, 6, 6, 6, 8, 9, 10, 12, 12, 14

මධ්‍යස්ථය $= \frac{6+8}{2} = 7$

ඉවතින් ... අගයන් 8 - k, 8, 8+ k වේ

නව ... මධ්‍යන්‍යය ද $\frac{8-k+8+8+k}{3} = 8$ වේ.

නව කුලකයේ මධ්‍යන්‍යය ද 8 වේ.
නව කුලකයේ විචලතාව 12 නිසා

$12 = \frac{1}{15}\sum_{i=1}^{n}(x_i - 8)^2$

$180 = (3-8)^2 + (4-8)^2 + 4(6-8)^2 + (8-8)^2 + (9-8)^2$
$\quad + (10-8)^2 + 2(12-8)^2 + (14-8)^2 + (8-k-8)^2$
$\quad + (8-8)^2 + (8+k-8)^2$

$180 = 25 + 16 + 16 + 0 + 1 + 4 + 32 + 36 + k^2 + 0 + k^2$

$180 = 2k^2 + 130$

$50 = 2k^2$

$k^2 = 25$

$k = \pm 5$

** * **