01. (i) α හා β යනු $f(x) = 0$ හි මූල බැවින්

$\alpha + \beta = -2$ හා $\alpha\beta = 9$ වේ.

$\alpha^2 - 1 = \gamma$ හා $\beta^2 - 1 = \delta$ නම්

$\gamma + \delta = (\alpha^2 - 1) + (\beta^2 - 1)$
$= \alpha^2 + \beta^2 - 2$
$= (\alpha + \beta)^2 - 2\alpha\beta - 2$
$= (-2)^2 - 2.9 - 2$
$= -16$

$\gamma\delta = (\alpha^2 - 1)(\beta^2 - 1)$
$= \alpha^2\beta^2 - (\alpha^2 + \beta^2) + 1$
$= (\alpha\beta)^2 - [(\alpha + \beta)^2 - 2\alpha\beta] + 1$
$= 81 - [(-2)^2 - 2.9] + 1$
$= 96$

∴ [illegible]

$(x - \gamma)(x - \delta) = 0$
$\Rightarrow x^2 - (\gamma + \delta)x + \gamma\delta = 0$
$x^2 + 16x + 96 = 0$ //

(ii) $f(x) = k \Rightarrow x^2 + 2x + 9 = k$
$\Rightarrow x^2 + 2x + 9 - k = 0$
[illegible]
නම්
$\Delta = 0$
එනම් $4 - 4.1.(9 - k) = 0$
$\Rightarrow 9 - k = 1 \Rightarrow k = 8$ //

(iii) $\dfrac{1}{f(x)} = \dfrac{1}{x + 2x + 9} = \dfrac{1}{(x + 1)^2 + 8}$

[illegible] $x + 1 = 0$ [illegible]
එනම් $x = -1$ [illegible]
∴ [illegible] $= \dfrac{1}{8}$ //

(iv) $f(x) = \lambda x$ එනම් $x^2 + 2x + 9 = \lambda x$
$\Rightarrow x^2 + (2 - \lambda)x + 9 = 0$
[illegible]
[illegible] $(2 - \lambda)^2 - 36 < 0$ [illegible]
එනම් $(\lambda + 4)(8 - \lambda) > 0$

∴ [illegible] x [illegible]
$= \{\lambda \in \mathbb{R} ; -4 < \lambda < 8\}$ //

02. (a) [illegible]

$= {}^{12}C_4$
$= \dfrac{12!}{4!\,8!}$
$= \dfrac{12 \times 11 \times 10 \times 9 \times 8!}{4 \times 3 \times 2 \times 1 \times 8!}$
$= \underline{495}$

(i) [illegible]

∴ [illegible]

$= {}^{10}C_2$
$= \dfrac{10!}{2!\,8!}$
$= \dfrac{10 \times 9 \times 8!}{2 \times 1 \times 8!}$
$= 45$

(ii) [illegible]

[illegible]

$= {}^{10}C_3 + {}^{10}C_3$
$= \dfrac{10!}{3!\,7!} + \dfrac{10!}{3!\,7!}$
$= \dfrac{10 \times 9 \times 8 \times 7!}{3 \times 2 \times 1 \times 7!} \times 2$
$= \underline{240}$

(iii) [illegible]

[illegible]

$= {}^{10}C_4$
$= \dfrac{10!}{4!\,6!}$
$= \dfrac{10 \times 9 \times 8 \times 7 \times 6!}{4 \times 3 \times 2 \times 1 \times 6!}$
$= \underline{210}$

(b) (i) $\left(\dfrac{7}{6x} - \dfrac{6x}{7}\right)^{13}$

$= \sum_{r=0}^{13} {}^{13}C_r \left(\dfrac{7}{6x}\right)^{13-r} \left(-\dfrac{6x}{7}\right)^{r}$

$= \sum_{r=0}^{13} {}^{13}C_r (-1)^r \left(\dfrac{7}{6}\right)^{13-2r} x^{2r-13}$

r හි සියලු නිඛිල අගය සඳහා $2r - 13$ [illegible] වේ.

[illegible] x හි [illegible] $\dfrac{1}{x}$ හි [illegible]

(ii) $\dfrac{1}{x}$ [illegible]

$2r - 13 = -1$ වේ. එනම් $r = 6$ වේ.

එවිට $\dfrac{1}{x}$ හි සංගුණකය

$= {}^{13}C_6 (-1)^6 \left(\dfrac{7}{6}\right)^{13-12}$

$= \dfrac{13!}{7!\,6!} \times 1 \times \dfrac{7}{6}$

$= \dfrac{13 \times 12 \times 11 \times 10 \times 9 \times 8 \times 7!}{7! \times 6 \times 5 \times 4 \times 3 \times 2 \times 1} \times \dfrac{7}{6}$

$= 13 \times 11 \times 2 \times 7$
$= \underline{2002}$

03. (a) සියලු ධන නිඛිලමය n සඳහා
$S(n) : n! \geq 2^{n-1}$ ලෙස ගනිමු.
$1! = 1$ හා $2^{1-1} = 2^0 = 1$ බැවින් $n = 1$ විට
S(1) සත්‍ය වේ.
S(k) සත්‍ය යයි උපකල්පනය කරමු. මෙහි k
ධන නිඛිලයකි.
එනම් $k! \geq 2^{k-1}$
දැන්
$(k + 1)! = k!\,(k + 1) \geq$
$2^{k-1}(k + 1) \geq 2^{k-1}.2 = 2^k$
($\because k \geq 1$ බැවින් $k + 1 \geq 2$)
එනයින්
$(k + 1)! \geq 2^{(k+1)-1}$
එනම් S (k + 1) සත්‍ය වේ
[illegible] සියලු ධන නිඛිලමය n සඳහා S(n) සත්‍ය වේ //

සියලු n සඳහා $\dfrac{1}{n!} \leq \dfrac{1}{2^{n-1}}$ වේ.
($\because n! \geq 2^{n-1}$ බැවින්)

$\therefore \sum_{k=1}^{n} \dfrac{1}{k!} \leq \sum_{k=1}^{n} \dfrac{1}{2^{k-1}}$

$\sum_{k=1}^{n} \dfrac{1}{2^{k-1}} = \dfrac{1 - \left(\frac{1}{2}\right)^n}{1 - \left(\frac{1}{2}\right)} = 2 - 2\left(\dfrac{1}{2}\right)^n$

$= 2 - \left(\dfrac{1}{2}\right)^{n-1}$

$\therefore \sum_{k=1}^{n} \dfrac{1}{k!} \leq 2 - \dfrac{1}{2^{n-1}}$ //

දැන්

$e = \lim_{n \to \infty} \sum_{k=0}^{n} \dfrac{1}{k!}$

$= \lim_{n \to \infty} \left[1 + \sum_{k=1}^{n} \dfrac{1}{k!}\right]$

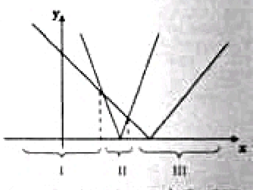
$= 1 + \lim_{n \to \infty} \sum_{k=1}^{n} \dfrac{1}{k!}$

$\leq 1 + \lim_{n \to \infty} \left[2 - \dfrac{1}{2^{n-1}}\right]$

$= 1 + 2 - \lim_{n \to \infty} \left[\dfrac{1}{2^{n-1}}\right]$

≤ 3 //

(b)

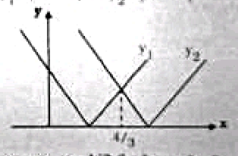


[illegible] a හා b හි [illegible] I U III [illegible] II [illegible]

[illegible] (4/3, ∞) [illegible]

එවිට $b = 3$

$y_1 = |bx - 2|$ හා $y_2 = |3x - a|$ නම්



y_1 හා y_2, $x = 4/3$ දී [illegible]

$bx - 2 = -(3x - a)$; $x = \dfrac{4}{3}$ දී

[illegible]

$a = (b + 3)x - 2$

$b = 3$ [illegible] $x = \frac{4}{3}$ [illegible]

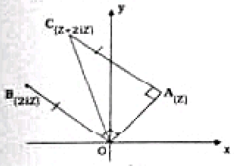
$a = 6 \times \frac{4}{3} - 2 = 6$

∴ [illegible]

a [illegible] b [illegible]

$a = 6,\ b = 3$ [illegible]

04.



2 iz [illegible] OA [illegible] 2|OA| [illegible] B [illegible]

z + 2 iz [illegible]

OB [illegible] A [illegible] AC [illegible] C [illegible]

$\hat{AOB} = \frac{\pi}{2}$ [illegible] $\tan \hat{AOC} = \frac{AC}{OA}$

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

(i) C [illegible]

$\arg(z) = \frac{\pi}{2} - \hat{AOC}$

[illegible]

$\frac{y}{x} = \tan\left(\frac{\pi}{2} - \hat{AOC}\right) = \cot \hat{AOC}$

$= \frac{1}{2}$

$\therefore x - 2y = 0$ //

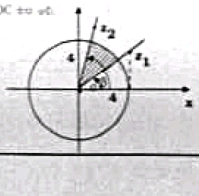
(ii) $y = 2x$ [illegible] $\arg(z) = \tan^{-1}(2)$

[illegible]

$\arg(z + 2iz)$
$= \arg z(1 + 2i)$
$= \arg z + \arg(1 + 2i)$
$= \tan^{-1}(2) + \tan^{-1}(2)$
$= 2\tan^{-1}(2)$
$= 2\arg(z)$
$= \arg(z^2)$

∴ z^2 OC [illegible]

(iii)



[illegible] β [illegible]

$\arg z_2 = \tan^{-1}(2)$ [illegible]

$\arg(z_1) = \tan^{-1}\frac{1}{2}$ [illegible]

[illegible]

$\beta - \alpha = \theta$ [illegible]

$\tan\theta = \tan(\beta - \alpha)$

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

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

∴ $\theta = \tan^{-1}\left(\frac{3}{4}\right)$

[illegible]

$= \frac{1}{2}\theta r^2 = \frac{1}{2} \cdot 4^2 \tan^{-1}\left(\frac{3}{4}\right)$

$= 8\tan^{-1}\left(\frac{3}{4}\right)$ //

05. (a) $y = e^{4x}\sin 3x$

$\Rightarrow \frac{dy}{dx} = e^{4x} \cdot 3\cos 3x + \sin 3x \cdot 4e^{4x}$

$= 3e^{4x}\cos 3x + 4y$ — ①

$\frac{d^2y}{dx^2} = 3e^{4x}(-3\sin 3x)$

$+ 3\cos 3x \cdot 4e^{4x} + 4\frac{dy}{dx}$

$= -9e^{4x}\sin 3x + 12e^{4x}\cos 3x$

$+ 4\frac{dy}{dx}$

$= -9y + 4\frac{dy}{dx} - 16y + 4\frac{dy}{dx}$

$= 8\frac{dy}{dx} - 25y$

$\Rightarrow \frac{d^2y}{dx^2} - 8\frac{dy}{dx} + 25y = 0$ // — ②

② [illegible] x [illegible]

$\frac{d^3y}{dx^3} - 8\frac{d^2y}{dx^2} + 25\frac{dy}{dx} = 0$ — ③

$x = 0$ [illegible] ① [illegible]

$\left(\frac{dy}{dx}\right)_{x=0} = 3.e^0.\cos 0 + 0 = 3$ //

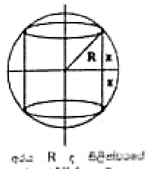
② [illegible] $\left(\frac{d^2y}{dx^2}\right)_{x=0} - 8.3 + 25.0 = 0$

$\left(\frac{d^2y}{dx^2}\right)_{x=0} = 24$ //

③ [illegible] $\left(\frac{d^3y}{dx^3}\right)_{x=0} - 8 \times 24 + 25 \times 3 = 0$

$\left(\frac{d^3y}{dx^3}\right)_{x=0} = 192 - 75 = 117$ //

(b)



[illegible] R [illegible] 2x [illegible] V(x) [illegible]

$V(x) = \pi(R^2 - x^2)2x$

$= 2\pi(R^2 - x^2)x$

[illegible]

$V'(x) = 2\pi[R^2 - x^2 + x(-2x)]$

$= 2\pi(R^2 - 3x^2)$

$= 6\pi\left[\frac{R^2}{3} - x^2\right]$

$= 6\pi\left[\frac{R}{\sqrt{3}} - x\right]\left[\frac{R}{\sqrt{3}} + x\right]$

$x > 0$ [illegible] $V'(x) = 0$ [illegible] $x = \frac{R}{\sqrt{3}}$

$x < \frac{R}{\sqrt{3}}$ [illegible] $V'(x) > 0$

$x > \frac{R}{\sqrt{3}}$ [illegible] $V'(x) < 0$

[illegible] $x = \frac{R}{\sqrt{3}}$ [illegible] V(x) [illegible]

∴ [illegible] $= V\left(\frac{R}{\sqrt{3}}\right)$

$= 2\pi\left[R^2 - \frac{R^2}{3}\right]\frac{R}{\sqrt{3}}$

$= \frac{4\pi R^3}{3\sqrt{3}} = \frac{1}{\sqrt{3}}\left(\frac{4\pi R^3}{3}\right)$

$= \frac{1}{\sqrt{3}}S$

[illegible] $S = \frac{4}{3}\pi R^3$ [illegible]

[illegible]

[illegible] $\frac{1}{\sqrt{3}}$ [illegible]

06. (a) $I = \int_1^2 \frac{x^3}{\sqrt{x^2 - 1}}dx \quad u = \sqrt{x^2 - 1}$

[illegible]

[illegible] $u^2 = x^2 - 1$

[illegible] $2u\,du = 2x\,dx$

[illegible]

$I = \int_0^{\sqrt{3}} \frac{(u^2 + 1)}{u}u\,du$

$= \int_0^{\sqrt{3}} (u^2 + 1)\,du$

$= \left(\frac{u^3}{3} + u\right)_0^{\sqrt{5}}$

$= \left(\frac{3\sqrt{3}}{3} + \sqrt{5} - 0\right)$

$= 2\sqrt{3}$ //

(b) $\int_0^1 x\tan^{-1}x\,dx$

$= \int_0^1 \tan^{-1}x \frac{d}{dx}\left(\frac{x^2}{2}\right)dx$

$= \left[\tan^{-1}x \cdot \frac{x^2}{2}\right]_0^1 - \frac{1}{2}\int_0^1 x^2 \cdot \frac{1}{1+x^2}dx$

$= \left[\frac{\pi}{4} \cdot \frac{1}{2} - 0\right]$

$\frac{1}{2}\int_0^1 \left[\frac{1 + x^2}{1 + x^2} - \frac{1}{1 + x^2}\right]dx$

$= \frac{\pi}{8} - \frac{1}{2}[x]_0^1 + \frac{1}{2}[\tan^{-1}x]_0^1$

$= \frac{\pi}{8} - \frac{1}{2} + \frac{\pi}{8}$

$= \frac{\pi}{4} - \frac{1}{2}$ //

(c) $\dfrac{5x-4}{(2+x)(1-x+x^2)} = \dfrac{A}{2+x} + \dfrac{Bx+C}{1-x+x^2}$

$\Rightarrow A = -2,\ B = 2,\ C = -1$

$\therefore \displaystyle\int_1^2 \frac{5x-4}{(1-x+x^2)(2+x)}\,dx$

$= \displaystyle\int_1^2 \frac{2x-1}{1-x+x^2}\,dx - 2\int_1^2 \frac{dx}{x+2}$

$= [\ln|1-x+x^2|]_1^2$
$\qquad - 2[\ln|x+2|]_1^2$

$= (\ln 3 - \ln 1) - 2(\ln 4 - \ln 3)$

$= 3\ln 3 - 2\ln 4$

$= \ln \dfrac{27}{16}$ //

02. $u_1 = 0$ [illegible] $u_2 = 0$ [illegible] $P(x_0, y_0)$ [illegible]

[illegible]

$a_1x_0 + b_1y_0 + c_1 = 0$ — ① [illegible]

$a_2x_0 + b_2y_0 + c_2 = 0$ — ②

[illegible] $u_1 + \lambda u_2 = a_1x + b_1y + c_1$
$\qquad + \lambda(a_2x + b_2y + c_2) = 0$ [illegible]

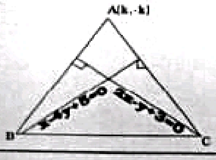
$\Rightarrow (a_1 + \lambda a_2)x + (b_1 + \lambda b_2)y + (c_1 + \lambda c_2) = 0$

λ [illegible]

[illegible] ① [illegible] ② [illegible] λ [illegible]
$(a_1x_0 + b_1y_0 + c_1) + \lambda(a_2x_0 + b_2y_0 + c_2) = 0$

$\therefore$ [illegible] (x_0, y_0) [illegible]

$\therefore u_1 + \lambda u_2 = 0$ [illegible] λ [illegible] $u_1 = 0$ [illegible] $u_2 = 0$ [illegible]



AB, $2x - y + 3 = 0$ [illegible]

AB, $x + 2y + p = 0$ [illegible]

[illegible] A (k, -k) [illegible]
$\qquad k - 2k + p = 0 \Rightarrow p = k$

$\therefore$ AB [illegible] $x + 2y + k = 0$ [illegible]

AC, $x - 4y + 5 = 0$ [illegible]

AC [illegible] $4x + y + q = 0$ [illegible]

A (k, -k) [illegible]

$4k - k + q = 0 \qquad \Rightarrow \quad q = -3k$

$\therefore$ AC [illegible] $4x + y - 3k = 0$ //

$2x - y + 3 = 0$ [illegible] $4x + y - 3k = 0$ C [illegible]

$C = \left[\dfrac{k-1}{2},\ k+2\right]$

$x - 4y + 5 = 0$ [illegible] $x + 2y + k = 0$ B [illegible]

$B = \left[-\left(\dfrac{2k+5}{3}\right),\ \dfrac{5-k}{6}\right]$

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

[illegible]

$\bar{x} = \dfrac{1}{3}\left[k - \left(\dfrac{2k+5}{3}\right) + \left(\dfrac{k-1}{2}\right)\right]$

$= \dfrac{6k - 4k - 10 + 3k - 3}{18}$

$= \dfrac{5k - 13}{18}$

$\bar{y} = \dfrac{1}{3}\left[k + \left(\dfrac{5-k}{6}\right) + (k+2)\right]$

$= \dfrac{-6k + 5 - k + 6k + 12}{18}$

$= \dfrac{17 - k}{18}$

$\bar{x} + 5\bar{y} = \dfrac{5k-13}{18} + \dfrac{5(17-k)}{18}$

$= \dfrac{1}{18}(5k - 13 + 85 - 5k)$

$= \dfrac{72}{18} = 4$

$\therefore$ G, $x + 5y - 4 = 0$ [illegible] //

04. [illegible] C_1 [illegible] C_2 [illegible] $C_1C_2 = |r_1 \pm r_2|$ [illegible]

[illegible] r_1 [illegible] r_2 [illegible]

[illegible]

$\sqrt{(g_1 - g_2)^2 + (f_1 - f_2)^2}$

$= \left|\sqrt{g_1^2 + f_1^2 - c_1} \pm \sqrt{g_2^2 + f_2^2 - c_2}\right|$ //

[illegible] (x_0, y_0) [illegible] C_1C_2 [illegible]

C_1C_2 [illegible]

$y - (-f_1) = \dfrac{(-f_1) - (-f_2)}{(-g_1) - (-g_2)}\,(x - (-g_1))$

$y + f_1 = \dfrac{(f_2 - f_1)}{(g_2 - g_1)}\,(x + g_1)$

[illegible]

$(g_2 - g_1)y + f_1g_2 - f_1g_1$
$\qquad = (f_2 - f_1)x + g_1f_2 - g_1f_1$

[illegible]

$(f_1 - f_2)x - (g_1 - g_2)y + f_1g_2 - f_2g_1 = 0$ //

[illegible]

$x_0^2 + y_0^2 + 2g_1x_0 + 2f_1y_0 + c_1 = 0$

[illegible]

$x_0^2 + y_0^2 + 2g_2x_0 + 2f_2y_0 + c_2 = 0$

$\Rightarrow 2(g_1 - g_2)x_0 + 2(f_1 - f_2)y_0 + c_1 - c_2 = 0$

[illegible] (x_0, y_0)

$2(g_1 - g_2)x + 2(f_1 - f_2)y_0 + c_1 - c_2 = 0$
[illegible]

[illegible]
$2(g_1 - g_2)x + 2(f_1 - f_2)y + c_1 - c_2 = 0$ [illegible] //

[illegible]

$x^2 + y^2 - 2x + 4y = 0$ [illegible]

$x^2 + y^2 - 10x + 20 = 0$ [illegible]

$C_1C_2 = \sqrt{(-1+5)^2 + (2-0)^2}$

$= \sqrt{20} = 2\sqrt{5}$

$r_1 = \sqrt{(-1)^2 + 2^2 - 0} = \sqrt{5}$

$r_2 = \sqrt{(-5)^2 - 20} = \sqrt{5}$

$r_1 + r_2 = 2\sqrt{5}$

$\therefore C_1C_2 = r_1 + r_2$

$\therefore$ [illegible]

[illegible] C_1C_2 [illegible]

$\therefore$ [illegible] $A = \left[\dfrac{1+5}{2},\ \dfrac{(-2)+0}{2}\right]$

$= (3, -1)$ //

P (x, y) [illegible]

[illegible] P [illegible]
$\sqrt{x^2 + y^2 - 2x + 4y}$ [illegible]

[illegible] $\sqrt{x^2 + y^2 - 10x + 20}$ [illegible]

$\sqrt{x^2 + y^2 - 2x + 4y}$
$\qquad = k\sqrt{x^2 + y^2 - 10x + 20}$

$\Leftrightarrow x^2 + y^2 - 2x + 4y$
$\qquad = k^2(x^2 + y^2 - 10x + 20)$

$\Leftrightarrow (k^2 - 1)x^2 + (k^2 - 1)y^2 - (10k^2 - 2)x$
$\qquad - 4y + 20k^2 = 0$

$(x^2 + y^2)(k^2 - 1) - (10k^2 - 2)x$
$\qquad - 4y + 20k^2 = 0$

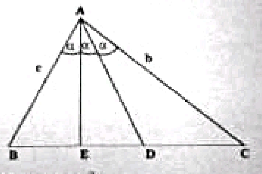
$k^2 - 1 \neq 0$ [illegible] P [illegible] A [illegible]

[illegible]

$x^2 + y^2 - \dfrac{(10k^2 - 2)}{k^2 - 1}\,x - \dfrac{4}{k^2 - 1}\,y$

$\qquad + \dfrac{20k^2}{k^2 - 1} = 0$ //

05



$BD = DC = \dfrac{a}{2}$

ABD Δ සඳහා සයින් නීතිය යෙදීමෙන්

$$\frac{BD}{\sin 2\alpha} = \frac{AB}{\sin A\hat{D}B}$$

$$\Rightarrow \sin A\hat{D}B = \frac{AB}{BD} \sin 2\alpha$$

ADC Δ සඳහා සයින් නීතිය යෙදීමෙන්

$$\frac{AC}{\sin A\hat{D}C} = \frac{DC}{\sin \alpha}$$

$$\Rightarrow \sin A\hat{D}C = \frac{AC}{DC} \sin \alpha$$

$$\sin A\hat{D}B = \sin A\hat{D}C$$

$$\Rightarrow \frac{AC}{DC} \sin\alpha = \frac{AB}{DC} \sin 2\alpha$$

$$\Rightarrow AC \sin \alpha = AB\, 2 \sin\alpha \cos \alpha$$

($\because$ DC = BD නිසා)

$$\Rightarrow \cos \alpha = \frac{AC}{2AB} = \frac{b}{2c}$$

$$\Rightarrow \cos \frac{A}{3} = \frac{b}{2c} \quad /\!/$$

$DE : EB = 1 : k \Rightarrow DE = \frac{1}{1+k} BD$ හා

$$EB = \frac{k}{1+k} BD$$

$$\Rightarrow DE = \frac{a}{2(1+k)} \text{ හා } EB = \frac{ak}{2(1+k)}$$

සහ

$$EC = DE + DC = \frac{a(2+k)}{2(1+k)}$$

AEC Δ ට සයින් නීතිය යෙදීමෙන්

$$\frac{EC}{\sin 2\alpha} = \frac{AC}{\sin A\hat{E}C}$$

$$\Rightarrow \sin A\hat{E}C = \frac{AC}{EC} \sin 2\alpha$$

එසේම AEB Δ න්

$$\frac{BE}{\sin \alpha} = \frac{AB}{\sin A\hat{E}B}$$

$$\Rightarrow \sin A\hat{E}B = \frac{AB}{BE} \sin \alpha$$

$$\sin A\hat{E}C = \sin A\hat{E}B$$

$$\Rightarrow \frac{AC}{EC} \sin 2\alpha = \frac{AB}{BE} \sin \alpha$$

$$\Rightarrow \cos \alpha = \frac{1}{2} \frac{AB \cdot EC}{BE \cdot AC}$$

$$= \frac{1}{2} \frac{2c(1+k)}{ak} \frac{a(2+k)}{2b(1+k)}$$

$$= \frac{(2+k)c}{2bk} \quad /\!/$$

k = 1 නම් $\cos \alpha = \frac{3c}{2b} = \frac{b}{2c} \Rightarrow b^2 = 3c^2$

$$\Rightarrow \left(\frac{b}{2c}\right)^2 = \frac{3}{4}$$

$$\Rightarrow \cos \alpha = \frac{b}{2c} = \frac{\sqrt{3}}{2} \quad \Rightarrow \alpha = 30^\circ$$

$$\therefore A = 3\alpha = 90^\circ$$

k = 2 නම් $\cos \alpha = \frac{4c}{4b} = \frac{b}{2c} \Rightarrow b^2 = 2c^2$

$$\Rightarrow \left(\frac{b}{2c}\right)^2 = \frac{1}{2}$$

$$\Rightarrow \cos \alpha = \frac{b}{2c} = \frac{1}{\sqrt{2}} \Rightarrow \alpha = 45^\circ$$

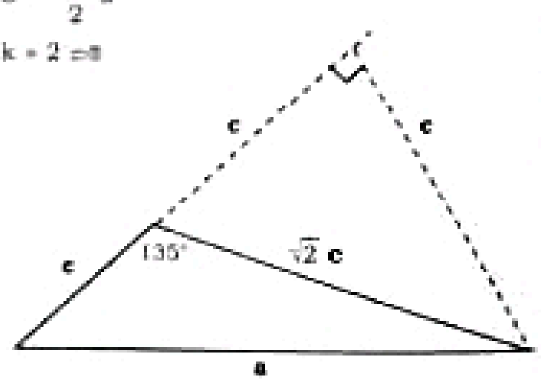
$$\therefore A = 135^\circ \quad /\!/$$

k = 1 නම්

$$a^2 = b^2 + c^2 = 3c^2 + c^2 = 4c^2 \Rightarrow c = \frac{a}{2},$$

$$b = \frac{\sqrt{3}}{2} a$$

k = 2 නම්



$$a^2 = (AC)^2 + (AB)^2 + 2(AB)(AC)\cos 45^\circ$$

$$= 2c^2 + c^2 + 2\sqrt{2}c^2 \frac{1}{\sqrt{2}}$$

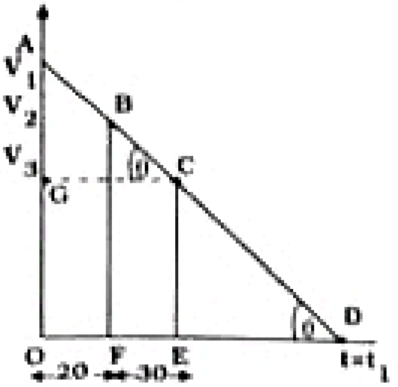
$$= 5c^2$$

$$\Rightarrow c^2 = \frac{a^2}{5}$$

$$\therefore c = \frac{a}{\sqrt{5}}, \; b = \sqrt{\frac{2}{5}}\, a \quad /\!/$$

*** ***

01. (a) (i)



OABF ⏢ $= 750$

$\Rightarrow \frac{(V_1+V_2)}{2}\ 20 = 750$

$V_1 + V_2 = 75$ — ①

BCEF ⏢ $= 750$

$\Rightarrow \frac{(V_2+V_3)}{2}\ 30 = 750$

$V_2 + V_3 = 50$ — ②

① - ② $\quad V_1 - V_3 = 25$ — ③

ACG Δ න්

$\tan\theta = a_1 = \frac{AG}{CG}$

[illegible] $a_1 = \frac{(V_1 - V_3)}{50}$

$\Rightarrow$ [illegible] $= \frac{25}{50} = \frac{1}{2}\ ms^{-1}$

(ii) OACE ⏢ $= 1500$

$\Rightarrow \frac{(V_1+V_3)}{2} \times 50$

$= 1500$

$V_1 + V_3 = 60$ — ④

④ - ③ $\quad 2V_3 = 35$

$\Rightarrow \quad V_3 = 17.5\ ms^{-1}$

(iii) ④ න් $V_1 = 42.5\ ms^{-1}$

AOD Δ න් $\tan\theta = \frac{AO}{OD}$

$\Rightarrow \quad \frac{1}{2} = \frac{42.5}{OD}$

$\therefore OD = t_1 = 85$ [illegible]

(b) [illegible] E) $= \rightarrow V$ [illegible] $= \uparrow$ [illegible]

[illegible] E) $= \rightarrow 2V$ [illegible] $=$ [45°]

[illegible]

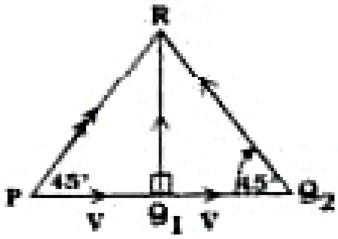
[illegible] E) $=$ [illegible]

[illegible] E) $= \uparrow + \rightarrow V$ | [illegible] E) $=$ [45°] $+ \rightarrow 2V$

$= \rightarrow V + \uparrow$ | $= \rightarrow 2V +$ [45°]

$= \overrightarrow{PQ_1} + \overrightarrow{Q_1R}$ | $= \overrightarrow{PQ_2} + \overrightarrow{Q_2R}$

$= \overrightarrow{PR}$ | $= \overrightarrow{PR}$

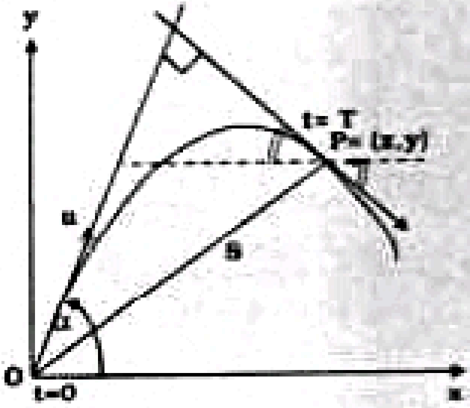


$PR = \sqrt{2}\,V$

$\therefore$ [illegible]

$\sqrt{2}\,V$ [illegible]

02. (a)



(i) O → P [illegible]

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

$\rightarrow \quad x = u\cos\alpha\ T$ — ①

$\uparrow \quad y = u\sin\alpha\ T - \frac{1}{2}gT^2$ — ②

T [illegible]

$\dot{x} = u\cos\alpha$ — ③

$\dot{y} = u\sin\alpha - gT$ — ④

$t = T$ [illegible] (90 - α) [illegible]

$\tan(90 - \alpha) = \frac{-\dot{y}}{\dot{x}}$ [illegible]

$\frac{\cos\alpha}{\sin\alpha} = -\frac{(u\sin\alpha - gT)}{u\cos\alpha}$

$\Rightarrow u\cos^2\alpha$

$= -u\sin^2\alpha + gT\sin\alpha$

$u(\cos^2\alpha + \sin^2\alpha) = gT\sin\alpha \Rightarrow$

$T = \frac{u}{g\sin\alpha}$

(ii) $S^2 = x^2 + y^2$

$S^2 = (u\cos\alpha\, T)^2 + (u\sin\alpha\, T - \frac{1}{2}gT^2)^2$

$S^2 = u^2\cos^2\alpha\, T^2 + u^2\sin^2\alpha\, T^2 - gu\sin\alpha\, T^3 + \frac{1}{4}g^2T^4$

$= u^2T^2 - gu\sin\alpha \cdot \frac{u}{g\sin\alpha}\, T^2 + \frac{1}{4}g^2T^4$

$(\because T = \frac{u}{g\sin\alpha}$ නිසා$)$

$S^2 = \frac{1}{4}g^2T^4 \Rightarrow S = \frac{1}{2}gT^2$

(b) (i) $54\ \text{kmh}^{-1} = 15\ \text{ms}^{-1}$

මුළු ප්‍රතිරෝධය $R = 300 \times 50$

$= 15000\ \text{N}$

[illegible] H [illegible] $V = 15$ [illegible]

ප්‍රකර්ෂණ බලය $P = \frac{H}{15}$ [illegible]

[illegible] $P = R$ වේ.

$\therefore \frac{H}{15} = 15000 \Rightarrow$

$H = 225000\ \text{W} = 225\ \text{kW}$

[illegible]

$= 250$ [illegible]

[illegible] a_1 [illegible]

[illegible] $= 250 \times 50$

$= 12500\ \text{N}$

ප්‍රකර්ෂණ බලය $15000\ \text{N}$ [illegible] $F = ma$ යෙදීමෙන්

$15000 - 12500 = 250 \times 1000\, a_1$

$\Rightarrow a_1 = \frac{1}{100}\ \text{ms}^{-2}$

(ii) [illegible] a_2 නම්, [illegible] $50 \times 50 = 2500\ \text{N}$ වේ.

$F = ma$ යෙදීමෙන්

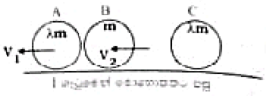
$-2500 = 50 \times 1000 \times a_2 \Rightarrow a_2 = -\frac{1}{20}$ වේ.

[illegible] $15\ \text{ms}^{-1}$ [illegible] $V^2 = u^2 + 2as$ [illegible] x නම්.

$0 = (15)^2 + 2\left(-\frac{1}{20}\right)x$

$x = 2250\ \text{m}$ වේ.

03. (a)



I ගැටුමෙන් පසු [illegible]

[illegible] $\lambda m V_1 + m V_2 = m u$ — ①

[illegible] $V_1 - V_2 = u$ — ②

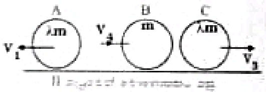
$(\because e = 1$ නිසා$)$

① $-\lambda \times$ ② $V_2 + \lambda V_2 = u - \lambda u$

$V_2 = \frac{u(1-\lambda)}{1+\lambda} < 0$

$(\because \lambda > 1$ නිසා$)$

$\therefore$ B [illegible] C [illegible]



II ගැටුමෙන් පසු [illegible]

[illegible] $\lambda m V_3 + m V_4 = m V_2$ — ③

[illegible] $V_3 - V_4 = V_2$ — ④

③ $- \lambda \times$ ④ $V_4 + \lambda V_4 = V_2 - \lambda V_2$

$V_4 = \frac{V_2(1-\lambda)}{1+\lambda}$

$< 0\ (\because \lambda > 1)$

$\therefore$ B [illegible] A [illegible]

I ගැටුමෙන් පසු A හි [illegible] II ගැටුමෙන් පසු B හි [illegible]

① + ② න් $V_1 = \frac{2u}{1+\lambda}$

[illegible]

$\frac{2u}{1+\lambda} \geq V_2 \frac{(\lambda-1)}{1+\lambda}$

$= u\frac{(\lambda-1)}{(1+\lambda)} \cdot \frac{(\lambda-1)}{(1+\lambda)}$

$\frac{2u}{1+\lambda} \geq u\frac{(\lambda-1)^2}{(1+\lambda)^2}$

$\Rightarrow 2(\lambda+1) \geq (\lambda-1)^2$

$2\lambda + 2 \geq \lambda^2 - 2\lambda + 1 \Rightarrow \lambda^2 - 4\lambda - 1 \leq 0$

$(\lambda - 2)^2 - 5 \leq 0 \Rightarrow \lambda - 2 \leq \pm\sqrt{5}$

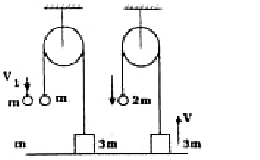
$\lambda \leq 2 \pm \sqrt{5}$ [illegible] $\lambda > 1$ [illegible]

$\lambda \leq 2 + \sqrt{5}$ [illegible]

(b) h [illegible] $V^2 = u^2 + 2as$

$V_1^2 = 2gh$

[illegible] J නම්. $J = \Delta(mv)$ යෙදීමෙන්



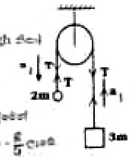
(3m) $\therefore J = 3mV - 3m(0)$; (m) ⇒ (m) ↓

$J = 2m(-V) - m(-V_1)$

$3mV = -2mV + mV_1 =$

$V = \frac{1}{5}V_1 = \frac{1}{5}u\ (\because u^2 = 2gh$ නිසා$)$

[illegible] a_1 නම්



$\downarrow 2mg - T = 2m a_1$
$\uparrow T - 3mg = 3m a_1$ } විසඳීමෙන් $a_1 = -\frac{g}{5}$ ලැබේ.

(3m) ට $\uparrow V^2 = u^2 + 2aS$ යෙදීමෙන්, [illegible] x නම්

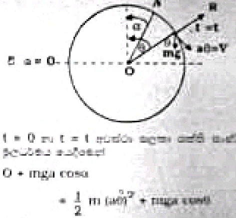
$0 = V^2 - \frac{2g}{5}x \Rightarrow \frac{2gx}{5} = \frac{u^2}{25} = \frac{2gh}{25}$

$\therefore x = \frac{2gh}{25} \times \frac{5}{2g} = \frac{h}{5}$; [illegible] t_1 නම්

$\uparrow V = u + at$ යෙදීමෙන්

$0 = \frac{u}{5} - \frac{g}{5}t_1 \Rightarrow t_1 = \frac{u}{g}$

04. (a)



$t = 0$ සිට $t = t$ [illegible]

$0 + mga\cos\alpha$

$= \frac{1}{2}m(a\dot\theta)^2 + mga\cos\theta$

[illegible]

$g\cos\alpha - g\cos\theta = \frac{1}{2}a\dot\theta^2$ [illegible]

[illegible]

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

$F = ma$, O [illegible]

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

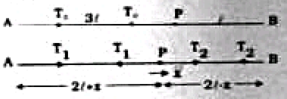
$R = mg\cos\theta - m2g(\cos\alpha - \cos\theta)$

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

[illegible] $R = 0$ වේ.

[illegible] $\cos\theta = \frac{2}{3}\cos\alpha$ [illegible]

(b)



$T_1 = \frac{mg(2l + x - l)}{l} = \frac{mg(l+x)}{l}$

$T_2 = \frac{mg(2l - x - l)}{l} = \frac{mg(l-x)}{l}$

$F = ma$, යෙදීමෙන් →

$T_2 - T_1 = m\ddot{x}$

$\frac{mg(l-x)}{l} - \frac{mg(l+x)}{l} = m\ddot{x}$

$\frac{g}{l}(l - x - l - x) = \ddot{x}$

$-\frac{2g}{l}x = \ddot{x}$

$\frac{2g}{l} = \omega^2$ නම් $\ddot{x} + \omega^2 x = 0$ වේ.

[illegible] $\ddot{x} = 0$ [illegible] $x = 0$ [illegible] AB [illegible]

$x = \ell$ විට $\dot{x} = 0$ බැවින්

($\because AP = 3\ell$ විට ක්ෂණිකව නිශ්චල බැවින්)

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

(විස්තාරය a නම්)

$O = \frac{2g}{\ell}(a^2 - \ell^2)$ බැවින් $a = \ell$ වේ

දෝලන කාලාවර්තය $T = \frac{2\pi}{\omega}$ බැවින්

$T = \frac{2\pi}{\sqrt{\frac{2g}{\ell}}} = \pi\sqrt{\frac{2\ell}{g}}$

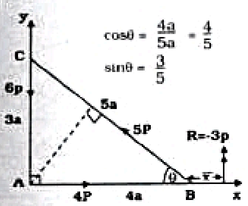
අංශුවේ ප්‍රවේගය උපරිම වන්නේ $x = 0$, එනම් කේන්ද්‍රයේදීය.

$\therefore$ උප. $\dot{x} = a\omega = \ell\sqrt{\frac{2\ell}{g}} = \sqrt{2g\ell}$

ඒ සඳහා ගතවන අවමත කාලය

$\frac{T}{4} = \frac{\pi}{4}\sqrt{\frac{2\ell}{g}} = \frac{\pi}{2}\sqrt{\frac{\ell}{2g}}$

05. (a)



$\cos\theta = \frac{4a}{5a} = \frac{4}{5}$

$\sin\theta = \frac{3}{5}$

$\rightarrow X = 4P - 5P\cos\theta$

$= 4P - 5P \cdot \frac{4}{5} = 0$

$\uparrow Y = -6P + 5P\sin\theta$

$= -6P + 5P \cdot \frac{3}{5} = -3P$

සම්ප්‍රයුක්තයේ විශාලත්වය 3P ⊙ සමාන්තර වන අතර දිශාව CA දිශාවට වේ.

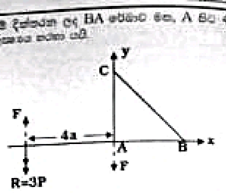
සම්ප්‍රයුක්තය දික්කළ AB රේඛාව B සිට $\overline{x}$ දුරින් මු ලකයක කපන යයි නම්, A වටා ඝූර්ණ ගැනීමෙන්

$\circlearrowleft$ $5P \times 4a \sin\theta = -3P \times (\overline{x} + 4a)$

$5P \times 4a \times \frac{3}{5} = -3P(\overline{x} + 4a) \Rightarrow$

$\overline{x} = -8a$

එනම් දික්කරන ලද BA රේඛාව මත, A සිට 4a දුරින් මු ලකයක කපන යයි.

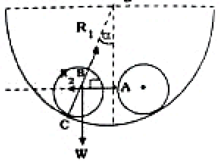


යෙදිය යුතු යුග්මයේ ඝූර්ණය M නම්, එය ACB අගට F × 4a විශාලත්වයකින් යුක්ත විය යුතුයි.

F = 3P විය යුතුයි.

$\therefore$ M = 3P × 4a = 12Pa වන අතර, ACB (දක්ෂිණාවර්ත) අතට විය යුතුයි.

(b)

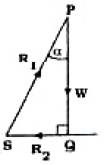


ප්‍රතික්‍රියා O හරහා ඇති සිරස් රේඛාව වටා සමමිතික වේ. එබැවින් එක් ගෝලයක් සැලකීම ප්‍රමාණවත්ය.

OC = b හා BC = a නිසා

OB = b − a

AB = a



බල ත්‍රිකෝණය QSP වේ. සයින් ප්‍රමේයය යෙදීමෙන්

$\frac{R_2}{\sin\alpha} = \frac{W}{\sin(90-\alpha)} \Rightarrow$

$R_2 = W\frac{\sin\alpha}{\cos\alpha} = W\tan\alpha$

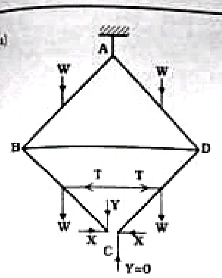
$\sin\alpha = \frac{AB}{OB} = \frac{a}{b-a}$

$\therefore \tan\alpha = \frac{a}{\sqrt{(b-a)^2 - a^2}}$

$= \frac{a}{\sqrt{b^2 - 2ab}}$

$\therefore R_2 = \frac{Wa}{\sqrt{b(b-2a)}}$

06. (a)



පද්ධතිය AC සිරස් රේඛාව වටා සමමිතික වේ. එබැවින් Y = O

AB, BC දණ්ඩවල සමතුලිතතාවය සලකා A වටා ඝූර්ණ ගැනීමෙන්,

$\circlearrowleft$: $W \times \cancel{a\cos45} + W \cdot \cancel{a\cos45} + X \cdot 4\cancel{a\cos45} = T \times 3\cancel{a\cos45}$

$2W + 4X = 3T$ —①

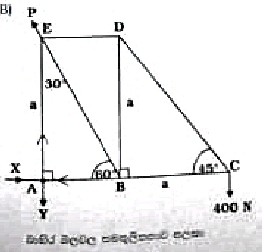
BC දණ්ඩේ සමතුලිතතාවය සලකා B වටා ඝූර්ණ ගැනීමෙන්

$\circlearrowleft$: $W \cancel{a\cos45} + T \cdot \cancel{a\cos45} = X \cdot 2\cancel{a\cos45}$

$W + T = 2X$ —②

① හා ② විසඳීමෙන් $T = 4W$ හා $X = \frac{5W}{2}$ බව ලැබේ.

(B)



සම්පූර්ණ රාමුවේ සමතුලිතතාව සලකා

A වටා ඝූර්ණ ගැනීමෙන්

$P \times a\sin30 = 400(a\tan30 + a)$

$P \times \frac{a}{2} = 400\cancel{a}\left(\frac{1}{\sqrt{3}} + 1\right)$

තිරස් විභේදනයෙන්

$X = P\cos60 = \frac{P}{2} = 400\left(\frac{1}{\sqrt{3}} + 1\right)$

$P = 800\left(\frac{1}{\sqrt{3}} + 1\right)$ N

සිරස් විභේදනයෙන්

$P\cos30 = Y + 400 \Rightarrow$

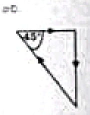
$Y = 800\left(\frac{1}{\sqrt{3}} + 1\right) \cdot \frac{\sqrt{3}}{2} - 400$

$= 400\sqrt{3}$ N

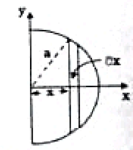
A සන්ධිය සැලකූ විට AB දණ්ඩේ ආතතියක් තෙරපුමක් වන අතර එය $400\left(\frac{1}{\sqrt{3}} + 1\right)$ N වේ. එමෙන් AE

දණ්ඩේ ඇත්තේ ආතතියක් වන අතර එය $400\sqrt{3}$ N වේ.

C සන්ධිය සඳහා ප්‍රත්‍යාබල සටහන ඇඳීමෙන්, BC හි තෙරපුමේ විශාලත්වය 400 N; CD හි ආතතියේ විශාලත්වය $400\sqrt{2}$ N වේ.



07.

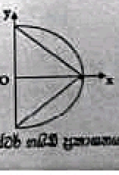


සමමිතිකත්වයෙන් ස්. කේ. X අක්ෂය මත වේ. O සිට x දුරින් δx ඝනකම ඇති තැටියක් සලකමු. එහි ඝනත්වය ρ නම් එම තැටියේ ස්කන්ධය $= \pi(a^2 - x^2)\delta x\,\rho$

ස්. කේ. අර්ථ දැක්වීමෙන්,

$\overline{x} = \frac{\int_0^a \pi(a^2 - x^2)\,dx\,\rho \cdot x}{\int_0^a \pi(a^2 - x^2)\,dx\,\rho}$ අනුකලනය ඇගයීමෙන්

$\overline{x} = \frac{3}{8}a$ බව ලැබේ.



[illegible]	[illegible]	[illegible]
	$\frac{2}{3}\pi a^3\rho$	$\frac{3}{8}a$
	$\frac{1}{3}\pi a^2 . a\rho$	$\frac{1}{4}a$
	$\frac{1}{3}\pi a^3\rho$	$\bar{x}$

[illegible]

$$\frac{2}{3}\pi a^3\rho . \frac{3a}{8} - \frac{1}{3}\pi a^3\rho . \frac{a}{4} = \frac{1}{3}\pi a^3\rho\bar{x}$$

$$\bar{x} = \frac{a}{2}$$

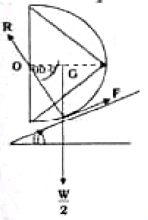
[illegible]

$$\cos(90-\theta) = \frac{\frac{a}{2}}{a} \Rightarrow \sin\theta = \frac{1}{2} \Rightarrow$$

$$\theta = 30^\circ$$

$W = \frac{2}{3}\pi a^3\rho$ [illegible]

[illegible] $\frac{W}{2}$ [illegible]



[illegible]

$F = \frac{W}{2}\sin\theta ; R = \frac{W}{2}\cos\theta$

[illegible] $\frac{F}{R} \le \mu$ [illegible]

$\tan\theta \le \mu \Rightarrow \mu \ge \frac{1}{\sqrt{3}}$

08. (a) A හා B [illegible]

$P(A\cap B) = P(A).P(B)$ — ①

$P(B) = P(B)$ — ②

② - ①

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

$P(A'\cap B) = P(B)\,[1 - P(A)]$

$P(A'\cap B) = P(B).P(A')$ — ③

∴ A′ හා B [illegible]

[illegible]

$P(A'\cap B) = P(A').P(B)$ — ③

$P(A') = P(A')$ — ④

④ - ③

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

$P(A\cup B)' = P(A')\,[1 - P(B)]$

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

A′ හා B′ [illegible]

[illegible]

[illegible] $= p$ [illegible]

$= 1 - p \times p = 1 - p^2$

$1 - p^2 > 0.999999 \Rightarrow 1 - 0.999999 > p^2$

$0.000001 > p^2 \Rightarrow 0.001 > p$

[illegible]

(b)

[illegible]	A	B	C
A	0	0	0
B	0	½	½
C	0	½	1

$P(A) = \frac{1}{4}$, $P(B) = \frac{1}{2}$

$P(C) = \frac{1}{4}$ [illegible]

X [illegible] A, B, C [illegible]

(A,A), (A,B), (A,C), (B,A), (B,B), (B,C), (C,A), (C,B), (C,C) ය

[illegible]

$P(X) = P[X|(A,A)]\,P(A,A) + P[X|(A,B)]\,P(A,B) + \cdots + P[X|(C,C)]\,P(C,C)$

[illegible] $P(A,A) = P(A).P(A)$; $P(A,B) = P(A).P(B)$ [illegible]

∴ P(X)

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

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

Y : [illegible]

$P(Y) = P[Y|(A,A)]\,P(A,A) + P[Y|(A,B)]\,P(A,B) + P[Y|(A,C)]\,P(A,C) + \ldots + P[Y|(C,C)]\,P(C,C)$

$P[Y|A,A] = 1$ ද

$P[Y|(A,C)] = P[Y|(B,C)]$
$= P[Y|(C,B)]$
$= P[Y|(C,A)]$
$= P[Y|(C,C)] = 0$ ද

$P[Y|(B,C)] = P[Y|(C,B)] = P[Y|(B,B)]$

$= \frac{3}{4}$ [illegible]

$$\therefore P(Y) = \left(1\times\frac{1}{4}\times\frac{1}{4}\right) + \left(\frac{3}{4}\times\frac{1}{4}\times\frac{1}{2}\right) + 0 + \left(\frac{3}{4}\times\frac{1}{2}\times\frac{1}{4}\right) + \left[\frac{3}{4}\times\frac{3}{4}\times\frac{1}{2}\times\frac{1}{2}\right] + 0 + 0 + 0 + 0$$

$$= \frac{1}{16} + \frac{3}{32} + \frac{3}{32} + \frac{9}{64}$$

$$= \frac{4+6+6+9}{64} = \frac{25}{64}$$

[illegible] Y [illegible] X [illegible]

[illegible]

$$P(X|Y) = \frac{P(X\cap Y)}{P(Y)} = \frac{\frac{3}{4}\times\frac{3}{4}\times\frac{1}{2}\times\frac{1}{2}}{\frac{25}{64}}$$

$$= \frac{9}{25}$$ //

09.

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	fd	fd^2
1	28 – 32	30	7	-2	-14	28
2	33 – 37	35	6	-1	-6	6
3	38 – 42	40	4	0	0	0
4	43 – 47	45	2	1	2	2
5	48 – 52	50	1	2	2	4
			20		-16	40

[illegible] $d = \frac{x-40}{5}$, 40 [illegible] (A) [illegible]

[illegible] 5 [illegible]

[illegible] $= A + \frac{\Sigma fd}{\Sigma f} \times C$

$= 40 + \frac{(-16)\times 5}{20} = 36$ [illegible]

[illegible] $= L + C\,(N/2 - F_{m-1})/f_{(m)}$

[illegible] L [illegible]
F_{m-1} - [illegible]

$f_{(m)}$ - [illegible]

[illegible] $= 32.5 + 5\left(\frac{20}{2} - 7\right)\div 6$

$= 35$ [illegible]

[illegible]

[illegible] $= $ [illegible] $+ \frac{C}{2}\left\{\frac{(f_2 - f_1) - (f_2 - f_3)}{(f_2 - f_1) + (f_2 - f_3)}\right\}$

$= 30 + \frac{5}{2}\left\{\frac{(7-0) - (7-6)}{(7-0) + (7-6)}\right\}$

$= 30 + \frac{5}{2}\left\{\frac{6}{8}\right\}$

$= 31.9 \triangleq 32$ [illegible]

[illegible] (36) > [illegible] (35) > [illegible] (32) [illegible]

[illegible] $= $ [illegible]^2

$$= C^2\left[\frac{\Sigma f_i d_i^2}{N} - \left(\frac{\Sigma f_i d_i}{N}\right)^2\right]$$

$$= 25\left[\frac{40}{20} - \left(\frac{-16}{20}\right)^2\right]$$

$$= 25\left[2 - \left(\frac{4}{5}\right)^2\right]$$

$$= 25\left[2 - \frac{16}{25}\right]$$

$$= 34$$

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

$$= \frac{3(36-35)}{\sqrt{34}} \triangleq 0.5$$

[illegible]	1	2	3	4	5
[illegible]	1	2	4	6	7

[illegible]

(i) [illegible] : [illegible]

(ii) [illegible] : [illegible] fd [illegible] fd^2 [illegible] Σfd [illegible]

(iii) [illegible] : [illegible] 4 [illegible] 1 [illegible] 45 – 1 = 44 [illegible]

[illegible] : [illegible] 45 [illegible]

[illegible] : [illegible] 1.9 [illegible] 50 [illegible] 1.9 [illegible] ∴ [illegible] = 50 - 1.9 ≅ 48 [illegible]

[illegible]	[illegible]	[illegible]	[illegible]
1	36 [illegible]	35 [illegible]	32 [illegible]
[illegible]	7.2 kg	7.0 kg	6.4 kg
2	44 [illegible]	45 [illegible]	48 [illegible]
[illegible]	8.8 kg	9.0 kg	9.6 kg

[illegible] 1 [illegible]

[illegible] 2 [illegible] 1 [illegible]

[illegible]

*** ***