Section - A

(1) $|adj A| = |A|^2 \Rightarrow 144 = |A|^2 \Rightarrow |A| = \pm 12$ $\quad\therefore$ option (c)

(2) $\begin{vmatrix} 2\sin x & 3 \\ 1 & 2\sin x \end{vmatrix} = 0 \Rightarrow 4\sin^2 x - 3 = 0 \Rightarrow \sin x = \pm\frac{\sqrt{3}}{2} \Rightarrow x = \frac{\pi}{3}, \frac{2\pi}{3}$

$\therefore$ option (d)

(3) $ar(\Delta ABC) = 0 \Rightarrow \begin{vmatrix} 3 & -2 & 1 \\ k & 2 & 1 \\ 8 & 8 & 1 \end{vmatrix} = 0 \Rightarrow k = 5$ $\quad\therefore$ option (b)

(4) here, $x + 2 = -(2x-3) \Rightarrow x = \frac{1}{3}$ $\quad\therefore$ option (a)

(5) $y = \tan^{-1}(\sec x + \tan x) = \tan^{-1}\left(\frac{1+\sin x}{\cos x}\right) = \tan^{-1}\left(\frac{1+\cos\left(\frac{\pi}{2}-x\right)}{\sin\left(\frac{\pi}{2}-x\right)}\right)$

$= \tan^{-1}\left(\frac{2\cos^2\left(\frac{\pi}{4}-\frac{x}{2}\right)}{2\sin\left(\frac{\pi}{4}-\frac{x}{2}\right)\cos\left(\frac{\pi}{4}-\frac{x}{2}\right)}\right)$

$= \tan^{-1}\left(\cot\left(\frac{\pi}{4}-\frac{x}{2}\right)\right)$

$= \tan^{-1}\left(\tan\left(\frac{\pi}{2}-\frac{\pi}{4}+\frac{x}{2}\right)\right)$

$= \frac{\pi}{4}+\frac{x}{2} \quad \therefore \frac{dy}{dx} = \frac{1}{2}$

$\therefore$ option (a)

(6) $k = \lim_{x\to 0}\frac{1-\cos 4x}{8x^2} = \lim_{x\to 0}\frac{2\sin^2 2x}{8x^2}$

$= \lim_{2x\to 0}\left(\frac{\sin 2x}{2x}\right)^2 = 1^2 = 1$ $\quad\therefore$ option (a)

(7) $I = \int\frac{x+3}{(x+4)^2}\cdot e^x dx = \int\frac{x+4-1}{(x+4)^2}\cdot e^x dx = \int\left[\frac{1}{x+4} - \frac{1}{(x+4)^2}\right]\cdot e^x dx$

$= \frac{e^x}{x+4} + C$ $\quad\therefore$ option (a)

(8) $I = \int\frac{dx}{e^x+e^{-x}} = \int\frac{e^x}{e^{2x}+1}dx$ $\quad$ Put $e^x = t$ $\quad\therefore I = \int\frac{dt}{1+t^2} = \tan^{-1}t + C$

$= \tan^{-1}e^x + C$ $\quad\therefore$ option (a)

(9) $A_{22} = \begin{vmatrix} 10 & 2 \\ 9 & 2 \end{vmatrix} = 2$; $A_{23} = -\begin{vmatrix} 10 & 19 \\ 9 & 24 \end{vmatrix} = -69$

$\therefore A_{22} + A_{23} = 2 + (-69) = -67$ $\quad\therefore$ option (c)

(10) $\frac{dy}{dx} + \frac{1}{x\log x}\cdot y = \frac{2}{x}$ $\quad\therefore$ I.F. $= e^{\int\frac{1}{x\log x}dx} = e^{\log(\log x)} = \log x$

$\therefore$ option (c)

(11) clearly $2+3=5$ $\therefore$ option (d)

(12) $\vec{AB} = 2\hat{i} + (4-x)\hat{j} + 4\hat{k}$; $\vec{BC} = (y-3)\hat{i} - 6\hat{j} - 12\hat{k}$

here, $\frac{2}{y-3} = \frac{4-x}{-6} = \frac{4}{-12}$ $\Rightarrow x = 2, y = -3$ $\therefore$ option (a)

(13) $\vec{a}.\vec{b} = -1 \Rightarrow |\vec{a}|.|\vec{b}|.\cos\theta = -1 \Rightarrow \cos\theta = -\frac{1}{2} \Rightarrow \theta = \cos^{-1}\left(-\frac{1}{2}\right) = \frac{2\pi}{3}$

$\therefore$ option (c)

(14) $A = \frac{1}{2}|\vec{d_1} \times \vec{d_2}| = \frac{1}{2}\begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 3 & 1 & -2 \\ 1 & -3 & 4 \end{vmatrix} = \frac{1}{2}|-2\hat{i} - 14\hat{j} - 10\hat{k}|$

$= \frac{1}{2}\sqrt{(-2)^2 + (-14)^2 + (-10)^2} = \frac{\sqrt{300}}{2} = 5\sqrt{3}$

$\therefore$ option (b)

(15) $\cos^2\frac{\pi}{3} + \cos^2\frac{\pi}{4} + \cos^2\gamma = 1 \Rightarrow \frac{1}{4} + \frac{1}{2} + \cos^2\gamma = 1 \Rightarrow \cos\gamma = \frac{1}{2} \Rightarrow \gamma = \frac{\pi}{3}$

$\Rightarrow$ option (b)

(16) $P(W, G, G) = \frac{4}{16} \times \frac{7}{15} \times \frac{6}{14} = \frac{1}{20}$ $\therefore$ option (a)

(17) $Z = 11x + 7y$

$Z_{(0,3)} = 21$; $Z_{(0,5)} = 35$; $Z_{(3,2)} = 47$ $\therefore$ option (a)

(18) option (d)

(19) option (a)

(20) option (d)

Section-B

(21) $\vec{d_1} = \vec{a} + \vec{b} = 3\hat{i} + 6\hat{j} - 2\hat{k}$ $\therefore |\vec{d_1}| = \sqrt{49} = 7$

$\vec{d_2} = \vec{b} - \vec{a} = \hat{i} + 2\hat{j} - 8\hat{k}$ $\therefore |\vec{d_2}| = \sqrt{69}$

$\therefore$ unit vectors along $\vec{d_1}$ & $\vec{d_2}$ are $\frac{1}{7}(3\hat{i} + 6\hat{j} - 2\hat{k})$ & $\frac{1}{\sqrt{69}}(\hat{i} + 2\hat{j} - 8\hat{k})$

OR

here, $|\vec{a}| = |\vec{b}| = 1$

also, $(\vec{a} + 3\vec{b}).(7\vec{a} - 5\vec{b}) = 0$

$\Rightarrow 7|\vec{a}|^2 + 16(\vec{a}.\vec{b}) - 15|\vec{b}|^2 = 0$

$\Rightarrow 16.|\vec{a}|.|\vec{b}|.\cos\theta = 15 - 7 \Rightarrow \cos\theta = \frac{8}{16} = \frac{1}{2}$

$\Rightarrow \theta = \frac{\pi}{3}$

(22) $\vec{AB} = \vec{OB} - \vec{OA} = (2\hat{i} - \hat{j} + 3\hat{k}) - (\hat{i} - \hat{j} + \hat{k}) = \hat{i} + 2\hat{k}$

$\vec{CD} = \vec{OD} - \vec{OC} = (3\hat{i} - 2\hat{j} + \hat{k}) - (2\hat{i} - 3\hat{k}) = \hat{i} - 2\hat{j} + 4\hat{k}$

Req. Projection $= \dfrac{\vec{AB}\cdot\vec{CD}}{|\vec{CD}|} = \dfrac{(1)(1) + 2(4)}{\sqrt{1+4+16}} = \dfrac{9}{\sqrt{21}}$ Ans

(23) Let $y = \sin\left(2\tan^{-1}\sqrt{\dfrac{1-x}{1+x}}\right)$

Put $x = \cos 2\theta \Rightarrow \theta = \frac{1}{2}\cos^{-1}x$

$\therefore y = \sin\left(2\tan^{-1}\sqrt{\dfrac{1-\cos 2\theta}{1+\cos 2\theta}}\right) = \sin\left(2\tan^{-1}(\tan\theta)\right) = \sin(2\theta)$

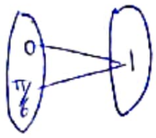
$= \sin(\cos^{-1}x)$

$= \sin(\sin^{-1}\sqrt{1-x^2})$

$= \sqrt{1-x^2}$ Ans

OR

$f: R \to R$; $f(x) = \sin^2 x + \cos^2 x$



$\therefore$ not one-one ; Not onto as $R_f = \{1\} \neq$ Co-domain

$\Rightarrow f$ is not bijective

(24) $y = \left[\log(x + \sqrt{x^2+1})\right]^2$

$\Rightarrow \dfrac{dy}{dx} = 2.\log(x + \sqrt{x^2+1}).\times\left[1 + \dfrac{\cancel{2}x}{\cancel{2}\sqrt{x^2+1}}\right] \times \dfrac{1}{x + \sqrt{x^2+1}}$

$= 2\log(x + \sqrt{x^2+1}).\left(\dfrac{\cancel{\sqrt{x^2+1} + x}}{\sqrt{x^2+1}} \times \dfrac{1}{\cancel{x + \sqrt{x^2+1}}}\right)$

$\Rightarrow \sqrt{1+x^2}\,.\,\dfrac{dy}{dx} = 2\log(x + \sqrt{x^2+1})$

diff. again,

$\sqrt{1+x^2}\,.\,\dfrac{d^2y}{dx^2} + \dfrac{dy}{dx}\cdot\dfrac{1}{2\sqrt{1+x^2}}.(2x) = 2 \times \dfrac{1}{x + \sqrt{x^2+1}} \times \left(1 + \dfrac{2x}{2\sqrt{x^2+1}}\right)$

$\Rightarrow (1+x^2).\dfrac{d^2y}{dx^2} + x\dfrac{dy}{dx} = 2$. Hence proved

(25)

$\dfrac{dV}{dt} = 12\ cm^3/s$; $h = \frac{1}{6}r \Rightarrow r = 6h$

Now, $V = \frac{1}{3}\pi r^2 h = \frac{1}{3}\pi(6h)^2 \times h \Rightarrow V = 12\pi h^3$

$\Rightarrow \dfrac{dV}{dt} = 36\pi h^2 \dfrac{dh}{dt} \Rightarrow 12 = 36 \times \pi h^2 \dfrac{dh}{dt}$

$\Rightarrow \left.\dfrac{dh}{dt}\right]_{h=4cm} = \dfrac{12}{36\pi(4)^2} = \dfrac{1}{48\pi}$ cm/s Ans

Section-C

(26) $I = \int_0^{\pi} \frac{x \tan x}{\sec x + \tan x} dx$ —— ①

$= \int_0^{\pi} \frac{(\pi - x) \cdot \tan(\pi - x)}{\sec(\pi - x) + \tan(\pi - x)} dx$

$I = \int_0^{\pi} \frac{+(\pi - x) \tan x}{+(\sec x + \tan x)} dx$ —— ②

adding ① + ②

$2I = \pi \int_0^{\pi} \frac{\tan x}{\sec x + \tan x} \times \frac{\sec x - \tan x}{\sec x - \tan x} dx$

$\Rightarrow I = \frac{\pi}{2} \cdot \int_0^{\pi} \frac{\sec x \tan x - \tan^2 x}{1} dx$

$= \frac{\pi}{2} \int_0^{\pi} (\sec x \tan x - \sec^2 x + 1) dx$

$= \frac{\pi}{2} [\sec x - \tan x + x]_0^{\pi} = \frac{\pi}{2} (\pi - 2)$ Ans

OR

$I = \int_1^4 |x-1| + |x-2| + |x-3| dx$

$= \int_1^2 (-x+4) dx + \int_2^3 x dx + \int_3^4 (3x-6) dx$

$= \left[-\frac{x^2}{2} + 4x\right]_1^2 + \left[\frac{x^2}{2}\right]_2^3 + \left[\frac{3x^2}{2} - 6x\right]_3^4 = \frac{19}{2}$ Ans

(27) $I = \int \frac{3x+1}{(x-2)^2(x+2)} dx$

Let $\frac{3x+1}{(x-2)^2(x+2)} = \frac{A}{x+2} + \frac{B}{x-2} + \frac{C}{(x-2)^2}$

$\Rightarrow 3x+1 = A(x-2)^2 + B(x-2)(x+2) + C(x+2)$

$\Rightarrow 3x+1 = A(x^2-4x+4) + B(x^2-4) + C(x+2)$

Equating, $A + B = 0$, $-4A + 2C = 6$; $4A + 2C = 1$

Solving, $A = -\frac{5}{16}$, $B = \frac{5}{16}$, $C = \frac{7}{4}$

$I = \frac{-5}{16} \int \frac{dx}{x+2} + \frac{5}{16} \int \frac{dx}{x-2} + \frac{7}{4} \int \frac{dx}{(x-2)^2}$

$= \frac{5}{16} \log\left|\frac{x-2}{x+2}\right| - \frac{7}{4(x-2)} + C$

(28) $I = \int \cos(\log x)\,.dx$

Put $\log x = t \Rightarrow x = e^t \Rightarrow dx = e^t\,dt$

$I = \int \underset{I}{\cos t}\,.\,\underset{II}{e^t}\,dt$

$= \cos t\,.\,e^t - \int(-\sin t).e^t\,dt$

$= \cos t\,.\,e^t + \int \underset{I}{\sin t}\,.\,\underset{II}{e^t}\,dt$

$= \cos t\,.\,e^t + \sin t\,.\,e^t - \int \cos t\,.e^t\,dt$

$= e^t(\cos t + \sin t) - I$

$\Rightarrow 2I = e^t(\cos t + \sin t) \quad \Rightarrow I = \frac{1}{2}e^t(\cos t + \sin t) + C$

$= \frac{1}{2}x.[\cos(\log x) + \sin(\log x)] + C$ Ans

(29) $(\tan^{-1}y - x).dy = (1+y^2).dx$

$\Rightarrow \frac{dx}{dy} + \frac{1}{1+y^2}.x = \frac{\tan^{-1}y}{1+y^2}$

$IF. = e^{\int\frac{1}{1+y^2}dy} = e^{\tan^{-1}y}$

Solution is: $\quad y.e^{\tan^{-1}y} = \underbrace{\int \frac{\tan^{-1}y}{1+y^2}.e^{\tan^{-1}y}\,dy}_{I}$

for I, $\tan^{-1}y = t \quad \therefore I = \int t.e^t\,dt = (t-1).e^t + C$

$\Rightarrow y = \tan t \qquad = (\tan^{-1}y - 1).e^{\tan^{-1}y} + C$

$\therefore$ soln is. $y.e^{\tan^{-1}y} = (\tan^{-1}y - 1).e^{\tan^{-1}y} + C$

OR

clearly given DE is homogeneous.

$\frac{dy}{dx} - \frac{y}{x} + \sin\left(\frac{y}{x}\right) = 0$

Put $\frac{y}{x} = v$ ie $y = vx \quad \Rightarrow \frac{dy}{dx} = v + x\frac{dv}{dx}$

Given DE becomes, $v + x\frac{dv}{dx} = v - \sin v$

$\Rightarrow \int \text{Cosec}\,v\,dv = -\int\frac{dx}{x}$

$\Rightarrow \log\left|\text{Cosec}\frac{y}{x} - \cot\frac{y}{x}\right| = -\log x + \log c$

$\Rightarrow \text{Cosec}\frac{y}{x} - \cot\frac{y}{x} = \frac{c}{x}$

when $x = 2, y = \pi \Rightarrow c = 2$

$\therefore$ Req. solution is $\text{Cosec}\frac{y}{x} - \cot\frac{y}{x} = \frac{2}{x}$ Ans

(30) $P(A)=\frac{1}{2}$, $P(B)=\frac{1}{2}$; $P(\bar{A})=\frac{1}{2}$, $P(\bar{B})=\frac{1}{2}$

Prob. of winning by A $= P(A) + P(\bar{A}\bar{B}A) + P(\bar{A}\bar{B}\bar{A}\bar{B}A) + \dots \infty$

$= \frac{1}{2} + \left(\frac{1}{2}\right)^2 \cdot \frac{1}{2} + \left(\frac{1}{2}\right)^4 \cdot \frac{1}{2} + \dots$

$= \dfrac{\frac{1}{2}}{1-\frac{1}{4}} = \underline{\frac{2}{3}}$ $\left(\because a + ar + \dots \infty = \frac{a}{1-r}\right)$

$P(B) = 1 - \frac{2}{3} = \underline{\frac{1}{3}}$

OR

Total people = 50

E : People believe in non-violence ; F : People believe in violence

$P(E) = \frac{20}{50}$, $P(\bar{E}) = \frac{30}{50}$

X : No. of non-violent person ; $x = 0, 1, 2$

$P(X=0) = \frac{30}{50} \times \frac{29}{49}$

$P(X=1) = 2 \times \frac{30}{50} \times \frac{20}{49}$

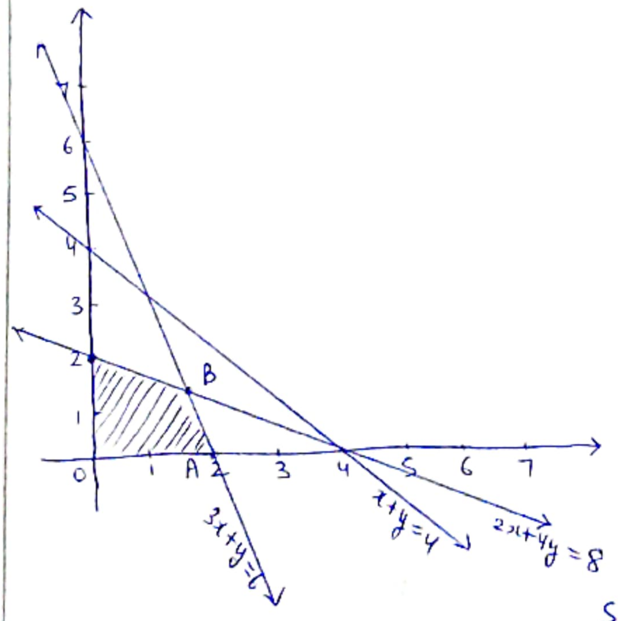
$P(X=2) = \frac{20}{50} \times \frac{19}{49}$

P.D. table

X	0	1	2
P(X)	$\frac{30}{50}\times\frac{29}{49}$	$2\times\frac{30}{50}\times\frac{20}{49}$	$\frac{20}{50}\times\frac{19}{49}$

$E(X) = \frac{196}{245}$

(31)



Point	$Z = 2x + 5y$
(0,0)	0
(2,0)	4
(0,2)	10 → max
$\left(\frac{8}{5}, \frac{6}{5}\right)$	$\frac{46}{5}$

$\therefore$ Z is max. at (0,2).

Max. value $= \underline{10}$

Section - D

(32) $|A| = 1200 \neq 0 \Rightarrow A^{-1}$ exists

$A^{-1} = \frac{1}{|A|} \cdot \text{adj}A = \frac{1}{1200}\begin{pmatrix} 75 & 150 & 75 \\ 110 & -100 & 30 \\ 72 & 0 & -24 \end{pmatrix}$

$AX = B \Rightarrow X = A^{-1}.B = \frac{1}{1200}\begin{pmatrix} 75 & 150 & 75 \\ 110 & -100 & 30 \\ 72 & 0 & -24 \end{pmatrix}\begin{pmatrix} 2 \\ 5 \\ -4 \end{pmatrix} = \begin{pmatrix} \frac{1}{2} \\ -\frac{1}{3} \\ \frac{1}{5} \end{pmatrix} = \begin{pmatrix} 1/x \\ 1/y \\ 1/2 \end{pmatrix}$

$\therefore x = 2, y = -3, z = 5$ Ans

OR

$AB = 4I \Rightarrow B^{-1} = \frac{1}{4} \cdot A$

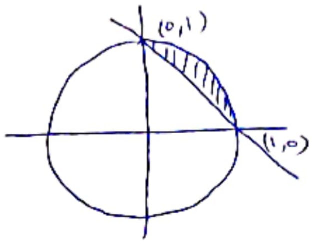
Given system $BX = C \Rightarrow X = B^{-1}C = \frac{1}{4} A.C$

$$= \frac{1}{4}\begin{bmatrix} -5 & 1 & 3 \\ 7 & 1 & -5 \\ 1 & -1 & 1 \end{bmatrix}\begin{bmatrix} 1 \\ 4 \\ 2 \end{bmatrix}$$

$$= \frac{1}{4}\begin{bmatrix} 8 \\ 4 \\ -4 \end{bmatrix} = \begin{bmatrix} 2 \\ 1 \\ -1 \end{bmatrix}$$

$\therefore \underline{x = 2, y = 1, z = -1}$ Ans.

(33) $A = \{(x,y) : x^2 + y^2 \le 1 \le x + y\}$



Consider, $x^2 + y^2 = 1$ and $x + y = 1$

$A = \int_0^1 (y \text{ of circle})\,dx - \int_0^1 (y \text{ of line})\,dx$

$= \int_0^1 \sqrt{1-x^2}\,dx - \int_0^1 (1-x)\,dx$

$= \left[\frac{x}{2}\sqrt{1-x^2} + \frac{1}{2}\sin^{-1}x - x + \frac{x^2}{2}\right]_0^1 = \left(\frac{\pi}{4} - \frac{1}{2}\right)$ sq. units.

(34) $f(x) = 5x^2 + 6x - 9$

for $\underline{\text{one-one}}$ Let $x_1, x_2 \in R_+$

let $f(x_1) = f(x_2)$

$\Rightarrow 5x_1^2 + 6x_1 - 9 = 5x_2^2 + 6x_2 - 9$

$\Rightarrow (x_1 - x_2)(5x_1 + 5x_2 + 6) = 0$

$\Rightarrow x_1 = x_2 \Rightarrow f$ is one-one

for onto : $y = 5x^2 + 6x - 9$

$\Rightarrow 5x^2 + 6x - 9 - y = 0 \quad \Rightarrow x = \frac{-6 \pm \sqrt{36 + 4 \times 5(9+y)}}{10} > 0$

$\Rightarrow -6 \pm \sqrt{216 + 20y} > 0$

$\Rightarrow 216 + 20y > 36 \Rightarrow y \in (-9, \infty) =$ Co-domain.

$\therefore f$ is onto

$\Rightarrow f$ is bijective fn.

OR

$R = \{(a,b) : a, b \in A \;;\; |a-b|$ is div. by $4\}$

for reflexive : $|a-a|$ i.e. 0, is div. by $4 \Rightarrow (a,a) \in R \Rightarrow R$ is reflexive.

for symmetric : Let $(a,b) \in R \Rightarrow |a-b|$ is div. by 4

$\Rightarrow |b-a|$ is div. by $4 \Rightarrow (b,a) \in R \Rightarrow R$ is symm.

for transitive : Let $(a,b), (b,c) \in R$

$\Rightarrow |a-b|$ is div. by 4 and $|b-c|$ is div. by 4

$\Rightarrow a-b = \pm 4\lambda$ and $b-c = \pm 4\mu$

$\Rightarrow a-c = \pm 4(\lambda+\mu) = \pm 4\lambda' \Rightarrow |a-c|$ is div. by $4 \Rightarrow (a,c) \in R \Rightarrow R$ is transitive

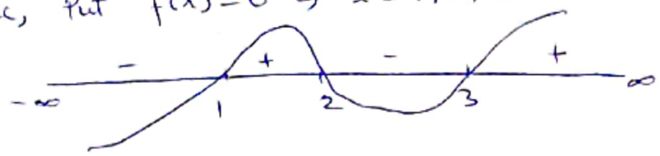
$\therefore R$ is equivalence Relation.

Now ; $[1] = \{1, 5, 9\}$ and $[2] = \{2, 10\}$

(35) $f(x) = x^4 - 8x^3 + 22x^2 - 24x + 21$

$f'(x) = 4x^3 - 24x^2 + 44x - 24 = 4(x^3 - 6x^2 + 11x - 6) = 4(x-1)(x-2)(x-3)$

for inc/dec, Put $f'(x) = 0 \Rightarrow x = 1, 2, 3$



(a) f is inc when $x \in [1,2] \cup [3,\infty)$

(b) f is dec. when $x \in (-\infty,1] \cup [2,3]$

Section-E

(36) E_1: farmer is selected from village A

E_2: " " " " " B

E_3: " " " " " C

A: farmer selected believes in technology

$P(E_1) = P(E_2) = P(E_3) = \frac{1}{3}$

$P(A|E_1) = \frac{60}{100}$, $P(A|E_2) = \frac{70}{100}$, $P(A|E_3) = \frac{80}{100}$

(i) $P(A|E_1) = \frac{60}{100}$

(ii) $P(A) = P(E_1).P(A|E_1) + P(E_2).P(A|E_2) + P(E_3).P(A|E_3)$

$= \frac{1}{3} \times \frac{60}{100} + \frac{1}{3} \times \frac{70}{100} + \frac{1}{3} \times \frac{80}{100} = \frac{210}{300} = \frac{7}{10}$

(iii) $P(E_2|A) = \frac{P(E_2).P(A|E_2)}{P(A)}$

$= \frac{\frac{1}{3} \times \frac{70}{100}}{\frac{210}{300}} = \frac{1}{3}$

(37) (i) $2y + x + \pi\left(\frac{x}{2}\right) = 10 \Rightarrow y = \frac{1}{4}(20 - \pi x - 2x)$

(ii) $A = xy + \frac{1}{2}\pi\left(\frac{x}{2}\right)^2 = \frac{1}{4}.x(20 - \pi x - 2x) + \frac{1}{8}\pi x^2$

$\Rightarrow \frac{dA}{dx} = \frac{20 - 2\pi x - 4x}{4} + \frac{1}{4}\pi x = 0 \Rightarrow x = \frac{20}{4+\pi}$; $\frac{d^2A}{dx^2} < 0$ here.

OR

(iii) $A = \frac{x}{4}(20 - \pi x - 2x) + \frac{\pi x^2}{8} = \frac{50}{\pi + 4}$ Sq. units

(38) (i) $\vec{a}_2 - \vec{a}_1 = 3\hat{i} + 3\hat{j}$; $\vec{b}_1 \times \vec{b}_2 = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 1 & 2 & -1 \\ 2 & 1 & 1 \end{vmatrix} = 3\hat{i} - 3\hat{j} - 3\hat{k}$ $\therefore |\vec{b}_1 \times \vec{b}_2| = 3\sqrt{3}$

$\therefore SD = \frac{3(3) + 3(-3) + 0}{3\sqrt{3}} = 0$

(ii) line 1: $\frac{x}{1} = \frac{y}{2} = \frac{z}{-1} = \lambda \Rightarrow$ Any point $(\lambda, 2\lambda, -\lambda)$

line 2: $\frac{x-3}{2} = \frac{y-3}{1} = \frac{z}{1} = \mu \Rightarrow$ Any point $(2\mu+3, \mu+3, \mu)$

Pt. of collision, $\lambda = 2\mu + 3$; $2\lambda = \mu + 3$; $-\lambda = \mu$ $\Rightarrow \lambda = 1, \mu = -1$

Req. Point is $(1, 2, -1)$