Model Question Paper HSSC – II (3rd Set Solution)

Mathematics

SECTION – A (Marks 20)

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
A	D	B	B	D	C	C	A	A	D	C	B	B	C	D	B	C	B	D	D

SECTION – B

(i) $u(x) = \sqrt{x^2 - 3}$ and $v(x) = x^2 + 3$

(a) $u(x) = \sqrt{x^2 - 3}$

Substituting $x = v(x)$

$\Rightarrow u(v(x)) = \sqrt{\left(v(x)\right)^2 - 3}$ [01 Mark]

$\Rightarrow u(x^2 + 3) = \sqrt{(x^2 + 3)^2 - 3} = \sqrt{x^4 + 6x^2 + 6}$ [01 Mark]

(b) $v(x) = x^2 + 3$

Substituting $x = u(x)$

$\Rightarrow v(u(x)) = \left(u(x)\right)^2 + 3$ [01 Mark]

$\Rightarrow v(\sqrt{x^2 - 3}) = \left(\sqrt{x^2 - 3}\right)^2 + 3 = x^2$ [01 Mark]

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(ii) Let $(x) = \begin{cases} \frac{sin5x}{x} & if\ x < 0 \\ (1-x)^{-\frac{5}{x}} & if\ x \geq 0 \end{cases}$,

(a) $\lim_{x\to 0^-} f(x) = \lim_{x\to 0^-} \frac{sin5x}{x}$

Multiplying and Dividing by 5

$\Rightarrow \lim_{x\to 0^-} f(x) = \lim_{x\to 0^-} \frac{sin5x}{x} \times \frac{5}{5} = 5 \lim_{x\to 0^-} \frac{sin5x}{5x}$ [01 Mark]

Applying limit by using $\lim_{x\to 0} \frac{sinx}{x} = 1$

$\Rightarrow \lim_{x\to 0^-} f(x) = 5(1) = 5$ [01 Mark]

(b) $\lim_{x\to 0^+} f(x) = \lim_{x\to 0^+} (1-x)^{-5/x}$

$\Longrightarrow \lim_{x\to 0^+} f(x) = \lim_{x\to 0^+}[1+(-x)]^{\frac{1}{(-x)}\times 5}$ [01 Mark]

Applying limit by using $\lim_{x\to 0}(1+x)^{1/x} = e$

$\Longrightarrow \lim_{x\to 0^+} f(x) = e^5$ [01 Mark]

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(iii) Let$y = u(x)v(x)$

Taking increment

$y+\delta y = u(x+\delta x)v(x+\delta x)$ [01 Mark]

$\Longrightarrow \delta y = u(x+\delta x)v(x+\delta x) - u(x)v(x)$

Adding and Subtracting $u(x+\delta x)v(x)$ on R.H.S.

$\Longrightarrow \delta y = u(x+\delta x)v(x+\delta x) - u(x+\delta x)v(x) + u(x+\delta x)v(x) - u(x)v(x)$

[01 Mark]

$$\Longrightarrow \delta y = u(x+\delta x)\big(v(x+\delta x)-v(x)\big) + v(x)\big(u(x+\delta x)-u(x)\big)$$

Dividing δx on bothsides

$\Longrightarrow \frac{\delta y}{\delta x} = u(x+\delta x)\left(\frac{v(x+\delta x)-v(x)}{\delta x}\right) + v(x)\left(\frac{u(x+\delta x)-u(x)}{\delta x}\right)$ [01 Mark]

Taking $\lim_{\delta x\to 0}$ on bothsides

$$\Longrightarrow \lim_{\delta x\to 0}\frac{\delta y}{\delta x} = \lim_{\delta x\to 0}\big(u(x+\delta x)\big)\lim_{\delta x\to 0}\left(\frac{v(x+\delta x)-v(x)}{\delta x}\right) + v(x)\lim_{\delta x\to 0}\left(\frac{u(x+\delta x)-u(x)}{\delta x}\right)$$

Applying limit

$\Longrightarrow \frac{dy}{dx} = u(x)v'(x) + v(x)u'(x)$ [01 Mark]

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(iv) $y = \frac{1+cscx}{1-cscx}$

Differentiating y w.r.t. x.

$\Longrightarrow \frac{d}{dx}(y) = \frac{d}{dx}\left(\frac{1+cscx}{1-cscx}\right)$

$\Longrightarrow \frac{dy}{dx} = \frac{(1-cscx)\frac{d}{dx}(1+cscx)-(1+cscx)\frac{d}{dx}(1-cscx)}{(1-cscx)^2}$ [02 Marks]

$\Longrightarrow \frac{dy}{dx} = \frac{(1-cscx)(0-cscxcotx)-(1+cscx)(0+cscxcotx)}{(1-cscx)^2}$

$\Longrightarrow \frac{dy}{dx} = \frac{cscxcotx(-1+cscx-1-cscx)}{(1-cscx)^2} = \frac{-2cscxcotx}{(1-cscx)^2}$ [02 Marks]

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(v) $x^2 = \frac{x+y}{x-y}$

$\Longrightarrow x^2(x-y) = x+y$

$\Longrightarrow x^3 - x^2y = x+y$

Differentiating w.r.t. x

$\Longrightarrow \frac{d}{dx}(x^3) - \frac{d}{dx}(x^2y) = \frac{d}{dx}(x) + \frac{d}{dx}(y)$

$\Longrightarrow 3x^2 - x^2\frac{dy}{dx} - 2xy = 1 + \frac{dy}{dx}$

$\Longrightarrow (1+x^2)\frac{dy}{dx} = 3x^2 - 2xy - 1$ [02 Marks]

Again, differentiating w.r.t. x

$\Longrightarrow (1+x^2)\frac{d^2y}{dx^2} + 2x\frac{dy}{dx} = 6x - 2x\frac{dy}{dx} - 2y$

$\Longrightarrow (1+x^2)\frac{d^2y}{dx^2} = 6x - 2y - 4x\frac{dy}{dx}$

$\Longrightarrow (1+x^2)\frac{d^2y}{dx^2} = 6x - 2y - 4x\left(\frac{3x^2-2xy-1}{1+x^2}\right)$

$\Longrightarrow \frac{d^2y}{dx^2} = \frac{6x+6x^3-2y-2yx^2-12x^3+8x^2y+4x}{1+x^2}$

$\Longrightarrow \frac{d^2y}{dx^2} = \frac{10x-6x^3-2y+6yx^2}{1+x^2}$ [02 Marks]

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(vi) Let $I = \int \frac{x}{\sqrt{x-1}}dx$

Substituting $x - 1 = t^2 \Longrightarrow x = t^2 + 1$

$\Longrightarrow dx = 2tdt$ [02 Marks]

$I = \int \frac{t^2+1}{t}(2tdt)$

$I = 2\int(t^2+1)dt \Longrightarrow I = \frac{2t^3}{3} + 2t + C$ [02 Marks]

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(vii) $(1+x^2)y_1 = 1$ with $y(1) = 0$

$\Longrightarrow (1+x^2)\frac{dy}{dx} = 1$

By Separation of Variables

$\Longrightarrow dy = \frac{1}{1+x^2}dx$ [01 Mark]

Integrating on bothsides

$\Longrightarrow \int dy = \int \frac{1}{1+x^2}dx$

$\Longrightarrow y = \tan^{-1}x + C \quad \to (i)$ [01 Mark]

Using the initial condition; $y(x=1) = 0$

$\Longrightarrow 0 = \tan^{-1}(1) + C \Longrightarrow C = -\frac{\pi}{4}$ [01 Mark]

Substituting $C = -\frac{\pi}{4}$ in Eq. (i)

$\Longrightarrow y = \tan^{-1}x - \frac{\pi}{4}$ [01 Mark]

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$(viii)$ $\int_{-1}^{1}(1-|x|)dx$

$= \int_{-1}^{0}(1-(-x))dx + \int_{0}^{1}(1-(+x))dx$

$= \int_{-1}^{0}(1+x)dx + \int_{0}^{1}(1-x)dx$ [02 Marks]

$= \left[x + \frac{x^2}{2}\right]_{-1}^{0} + \left[x - \frac{x^2}{2}\right]_{0}^{1}$

$= \left[(0+1) + \frac{1}{2}(0-1)\right] + \left[(1-0) - \frac{1}{2}(1-0)\right]$

$= \left(1-\frac{1}{2}\right) + \left(1-\frac{1}{2}\right) = \frac{1}{2} + \frac{1}{2} = 1$ [02 Marks]

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(ix) Let $R(x,y)$ be the required point. [01 Mark]

Since, $|PR| = |QR|$ for $P(3,7)$ and $Q(11,-6)$

$\Rightarrow \sqrt{(x-3)^2 + (y-7)^2} = \sqrt{(x-11)^2 + (y+6)^2}$

$\Rightarrow (x-3)^2 + (y-7)^2 = (x-11)^2 + (y+6)^2$ [01 Mark]

$\Rightarrow x^2 - 6x + 9 + y^2 - 14y + 49 = x^2 - 22x + 121 + y^2 + 12y + 36$

$\Rightarrow -6x + 58 - 14y = -22x + 157 + 12y$

$\Rightarrow 16x - 26y = 99 \quad ---\rightarrow (i)$ [01 Mark]

Since the point R is on the y −axis, so $x = 0$

$\therefore$ Eq. $(i) \Rightarrow 16(0) - 26y = 99 \Rightarrow y = -\frac{99}{26} = -3.8$

Hence, $R(0,-3.8)$ is the required point. [01 Mark]

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(x) $2x - 5 = ky \quad ---\rightarrow (i)$

$(k+1)x = 6y - 3 \quad ---\rightarrow (ii)$

Eq. $(i) \Rightarrow y = \frac{2}{k}x - \frac{5}{k} \quad \Rightarrow m_1 = \frac{2}{k}$ [01 Mark]

Eq. $(ii) \Rightarrow y = \frac{k+1}{6}x + \frac{1}{2} \quad \Rightarrow m_2 = \frac{k+1}{6}$ [01 Mark]

Since, the two lines have the same gradients.

$\Rightarrow m_1 = m_2$

$\Rightarrow \frac{2}{k} = \frac{k+1}{6}$ [01 Mark]

$\Rightarrow k^2 + k - 12 = 0$

$\Rightarrow k = -4$ and $k = 3$ [01 Mark]

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(xi) First we find the equation of the line joining $A(0,6)$ and $B(8,0)$.

$\Rightarrow \frac{y-y_1}{y_2-y_1} = \frac{x-x_1}{x_2-x_1}$ [01 Mark]

$\Rightarrow \frac{y-6}{0-6} = \frac{x-0}{8-0} \Rightarrow 3x + 4y = 24 \quad ---\rightarrow (i)$ [01 Mark]

Another line is; $y = x + 1 \quad ---\rightarrow (ii)$

Substituting the value of y from Eq. (ii) in Eq. (i), we obtain

$\Rightarrow 3x + 4(x+1) = 24 \Rightarrow 7x = 20$

$\Rightarrow x = \frac{20}{7}$, Putting the value of x in Eq. (ii)

$\Rightarrow y = \frac{20}{7} + 1 = \frac{27}{7}$

Hence, the coordinates of point M, intersecting Eq. (i) and Eq. (ii) are $x = \frac{20}{7}$ and $y = \frac{27}{7}$

[02 Marks]

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(xii) Focus;$(3,0)$ and the equation of the directrix is; $x - 1 = 0$.

Where, $F(c,0) = (3,0) \Rightarrow c = 3$

And, Directrix is $x = \frac{a}{e} = 1 \Rightarrow a = e$ [01 Mark]

$\Rightarrow e = \frac{c}{a} = \frac{3}{e} \Rightarrow e^2 = 3 \quad \Rightarrow e = \sqrt{3}$ [01 Mark]

By the definition of hyperbola

$|PF| = e \cdot |PD|$

$\Rightarrow \sqrt{(x-3)^2 + (y-0)^2} = \sqrt{3}|x-1|$

$\Rightarrow x^2 - 6x + 9 + y^2 = 3(x^2 - 2x + 1)$

$\Rightarrow x^2 - 6x + y^2 = 3x^2 - 6x + 3 - 9$

$\Rightarrow -2x^2 + y^2 = -6$

$\Rightarrow \frac{x^2}{3} - \frac{y^2}{6} = 1$ [02 Marks]

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$(xiii)$ Eccentricity; $e = 0.8$,and

Foci; $F(0, \pm c) = (0, \pm 8)$

Since, $e = \frac{c}{a} = 0.8$

$\Rightarrow \frac{8}{a} = 0.8, \quad \Rightarrow \ a = 10$

Or the vertices are $(0, \pm 10)$ [02 Marks]

Now, Equation of the ellipse by definition is;

$$|PF| + |PF'| = 2a$$

$$\Rightarrow \sqrt{(x-0)^2 + (y-8)^2} + \sqrt{(x-0)^2 + (y+8)^2} = 2(10)$$

$$\Rightarrow \sqrt{x^2 + y^2 - 16y + 64} = 20 - \sqrt{x^2 + y^2 + 16y + 64}$$

$$\Rightarrow x^2 + y^2 - 16y + 64 = 400 + x^2 + y^2 + 16y + 64 - 40\sqrt{x^2 + y^2 + 16y + 64}$$

$$\Rightarrow 5\sqrt{x^2 + y^2 + 16y + 64} = 4y + 50$$

$$\Rightarrow 25x^2 + 25y^2 + 80y + 320 = 16y^2 + 400y + 2500$$

$\Rightarrow 25x^2 + 9y^2 - 320y - 2180 = 0$ [02 Marks]

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(xiv) $\underline{u} = 3\hat{\imath} - 2\hat{\jmath} + 6\hat{k}$

Length of $\underline{u}$: $|\underline{u}| = \sqrt{3^2 + (-2)^2 + 6^2} = 7$ [01 Mark]

Direction of $\underline{u}$: $\frac{\underline{u}}{|\underline{u}|} = \frac{3\hat{\imath} - 2\hat{\jmath} + 6\hat{k}}{7} = \frac{3}{7}\hat{\imath} - \frac{2}{7}\hat{\jmath} + \frac{6}{7}\hat{k}$ [01 Mark]

Product of the length and direction of $\underline{u}$ is:

$\Rightarrow |\underline{u}|\left(\frac{\underline{u}}{|\underline{u}|}\right) = 7\left(\frac{3}{7}\hat{\imath} - \frac{2}{7}\hat{\jmath} + \frac{6}{7}\hat{k}\right)$

$\Rightarrow |\underline{u}|\left(\frac{\underline{u}}{|\underline{u}|}\right) = 3\hat{\imath} - 2\hat{\jmath} + 6\hat{k}$ [02 Marks]

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(xv) Force:$F = \hat{\imath} - 2\hat{\jmath} + 3\hat{k}$

And origin$O(0,0,0)$ to the point $A(2, -1, 4)$

Position vector of $\overrightarrow{OA}$ is:

$$\vec{d} = \overrightarrow{OA} = (2-0)\hat{\imath} + (-1-0)\hat{\jmath} + (4-0)\hat{k}$$

$\Rightarrow \vec{d} = \overrightarrow{OA} = 2\hat{\imath} - \hat{\jmath} + 4\hat{k}$ [01 Mark]

Now, Work done $= \vec{F} \cdot \vec{d}$ [01 Mark]

$$\Rightarrow W = (\hat{\imath} - 2\hat{\jmath} + 3\hat{k}) \cdot (2\hat{\imath} - \hat{\jmath} + 4\hat{k})$$

$\Rightarrow W = 1(2) + (-2)(-1) + 3(4) = 16\, Joule$ [02 Marks]

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(xvi) The vertices of a triangle are $A(1,-1,0)$, $B(2,1,-1)$ and $C(-1,1,2)$.

Let $\underline{a} = \overrightarrow{AB} = \overrightarrow{OB} - \overrightarrow{OA} = (1,2,-1)$

And $\underline{b} = \overrightarrow{CA} = \overrightarrow{OA} - \overrightarrow{OC} = (2,-2,-2)$ [01 Mark]

Now, Area of triangle $= \frac{1}{2}\left|\underline{a} \times \underline{b}\right|$

$$\underline{a} \times \underline{b} = \begin{vmatrix} \hat{\imath} & \hat{\jmath} & \hat{k} \\ 1 & 2 & -1 \\ 2 & -2 & -2 \end{vmatrix}$$

Expanding for first Row, we obtain

$= -6\hat{\imath} - 0\hat{\jmath} - 6\hat{k}$ [02 Marks]

Area of triangle$= \frac{1}{2}\left|\underline{a} \times \underline{b}\right| = \frac{1}{2}\sqrt{(-6)^2 + 0^2 + (-6)^2}$

$= \frac{1}{2}\sqrt{36+36} = \frac{6}{2}\sqrt{2} = 3\sqrt{2}$ sq. units [01 Mark]

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SECTION – C

Q.3 Solution:

$$f(x) = \begin{cases} x^2 - 1 & if\ 2 < x < 3 \\ 2ax & if\ x = 3 \\ bx - 4 & if\ x > 3 \end{cases} \quad \text{is continuous } \forall x.$$

First, we find the value of $f(x)$ at $x = 3$

(i.e.) $f(x) = 2ax$

Substituting $x = 3$, we get

$\Rightarrow f(3) = 2a(3) = 6a$ $---\rightarrow (i)$ [02 Marks]

Second, we find limit of $f(x)$ at $x = 3$

L.H.Limit:

$$\lim_{x\to 3^-} f(x) = \lim_{x\to 3^-}(x^2 - 1)$$

Applying limit on R.H.S.

$\Rightarrow \lim_{x\to 3^-} f(x) = 3^2 - 1 = 8$ $---\rightarrow (ii)$

R.H.Limit:

$$\lim_{x\to 3^+} f(x) = \lim_{x\to 3^+}(bx - 4)$$

Applying limit on R.H.S.

$\Rightarrow \lim_{x\to 3^+} f(x) = b(3) - 4 = 3b - 4$ $---\rightarrow (iii)$ [02 Marks]

For continuous function, $\lim_{x\to 3} f(x)$ exists, so

$$\lim_{x\to 3^-} f(x) = \lim_{x\to 3^+} f(x)$$

From Eq. (ii) and (iii), we obtain

$$8 = 3b - 4$$

$\Rightarrow b = 4$ [02 Marks]

Third, $f(3) = \lim_{x\to 3} f(x)$

$$\Rightarrow 6a = 8$$

$\Rightarrow a = 4/3$ [02 Marks]

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Q.4 Solution:

We have,

$y = ae^x + be^{2x} + ce^{3x}$, where $a, b, c \in R$

We shall show that

$y_3 - 6y_2 + 11y_1 - 6y = 0$ $---\rightarrow (i)$

Differentiating w.r.t. (x)

$$\frac{d}{dx}(y) = a\frac{d}{dx}(e^x) + b\frac{d}{dx}(e^{2x}) + c\frac{d}{dx}(e^{3x})$$

$$\Rightarrow y_1 = ae^x + 2b(e^{2x}) + 3c(e^{3x})$$

$\Rightarrow y_1 = ae^x + 2be^{2x} + 3ce^{3x}$ [02 Marks]

Again, diff. w.r.t. (x)

$$y_2 = ae^x + 2be^{2x}(2) + 3ce^{3x}(3)$$

$\Rightarrow y_2 = ae^x + 4be^{2x} + 9ce^{3x}$ [02 Marks]

Again, diff. w.r.t. (x)

$$y_3 = ae^x + 4be^{2x}(2) + 9ce^{3x}(3)$$

$y_3 = ae^x + 8be^{2x} + 27ce^{3x}$ [02 Marks]

Taking L.H.S. of Eq. (i)

$$L.H.S. = y_3 - 6y_2 + 11y_1 - 6y$$

$$= (ae^x + 8be^{2x} + 27ce^{3x}) - 6(ae^x + 4be^{2x} + 9ce^{3x}) + 11(ae^x + 2be^{2x} + 3ce^{3x}) - 6(ae^x + be^{2x} + ce^{3x})$$

$$= ae^x + 8be^{2x} + 27ce^{3x} - 6ae^x - 24be^{2x} - 54ce^{3x} + 11ae^x + 22be^{2x} + 33ce^{3x} - 6ae^x - 6be^{2x} - 6ce^{3x}$$

$= 0 = R.H.S.$ (Proved) [02 Marks]

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Q.5 **Solution:**

$$\int_1^3 \frac{lnx \sin(lnx)}{x} dx$$

Substituting $lnx = t$

$$\Rightarrow \frac{1}{x} dx = dt$$

As $x \to 1$, then $t \to 0$

As $x \to 3$, then $t \to ln3$ [04 Marks]

$$\int_1^3 \frac{lnx \sin(lnx)}{x} dx = \int_0^{ln3} t\, sint\, dt$$

$= \left[t \int sint\, dt - \int \left\{\frac{d}{dt}(t) \int sint\, dt\right\} dt\right]_0^{ln3}$

$= [-tcost]_0^{ln3} - \int_0^{ln3} (-cost) dt$

$= -(ln3 \cos(ln3) - 0) + [sint]_0^{ln3}$

$= -ln3 \cos(ln3) + \sin(ln3)$

$= \sin(ln3) - ln3 \cos(ln3)$ [04 Marks]

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Q.6 **Solution:**

a) Let $P(x, y)$ be the required point.

Since, $\Delta PAB = 8\, sq. units$

Where $\Delta PAB = \frac{1}{2}\begin{vmatrix} 2 & 3 & 1 \\ 3 & 5 & 1 \\ x & y & 1 \end{vmatrix} = 8$

Expanding for R_3

$$\Rightarrow x\begin{vmatrix} 3 & 1 \\ 5 & 1 \end{vmatrix} - y\begin{vmatrix} 2 & 1 \\ 3 & 1 \end{vmatrix} + 1\begin{vmatrix} 2 & 3 \\ 3 & 5 \end{vmatrix} = 16$$

$$\Rightarrow x(-2) - y(-1) + 1(1) = 16$$

$$\Rightarrow -2x - y = 15$$

$\Rightarrow 2x + y = -15$ $---\to (i)$ [04 Marks]

b) Since $P(x, y)$ is equidistant from $A(2,3)$ and $B(3,5)$, then

$$|PA|^2 = |PB|^2$$

$$\Rightarrow (x-2)^2 + (y-3)^2 = (x-3)^2 + (y-5)^2$$

$$\Rightarrow x^2 - 4x + 4 + y^2 - 6y + 9 = x^2 - 6x + 9 + y^2 - 10y + 25$$

$\Longrightarrow 2x + 4y = 21 \qquad\qquad - - - \rightarrow (ii)$
Solving Eq. (i) and (ii) simultaneously, we get
$\Longrightarrow x = -27/2$ and $y = 12$ [04 Marks]

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Q.7 **<u>Solution:</u>**

a) Let the mixture contains x kg of food A and y kg of Food B.
Cost of food A is 50 and cost of food B is 70 per kg.
Total cost is: $z = 50x + 70y$
For vitamin A:
Food A contains 3 units and food B contains 2 units and total unit is at-most9.
$\Longrightarrow 3x + 2y \leq 9 \qquad\qquad - - - \rightarrow (i)$
For Vitamin C:
Food A contains 2 units and food B contains 3 units and total unit is at-most 12.
$\Longrightarrow 2x + 3y \leq 12 \qquad\qquad - - - \rightarrow (ii)$
Subject to the constraints $x \geq 0, y \geq 0$
The associated equations of (i) and (ii) are:

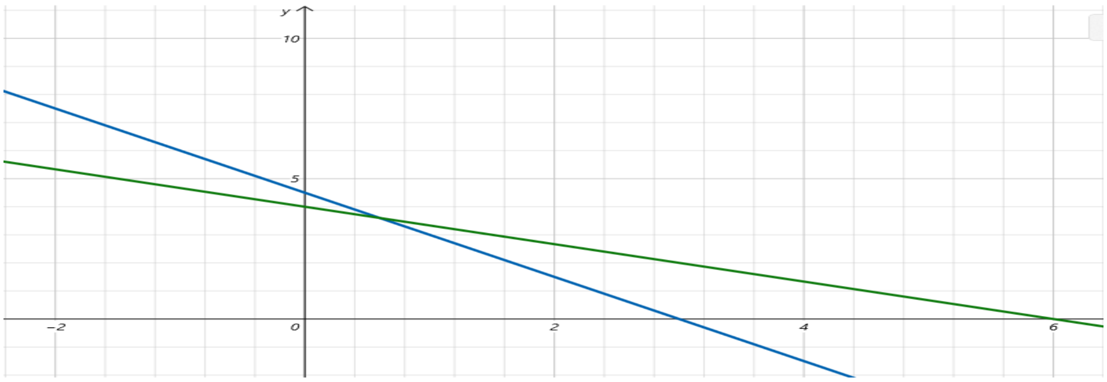
$$3x + 2y = 9$$

The points satisfying the associated equation are (3,0) and (0,4.5).

$$2x + 3y = 12$$

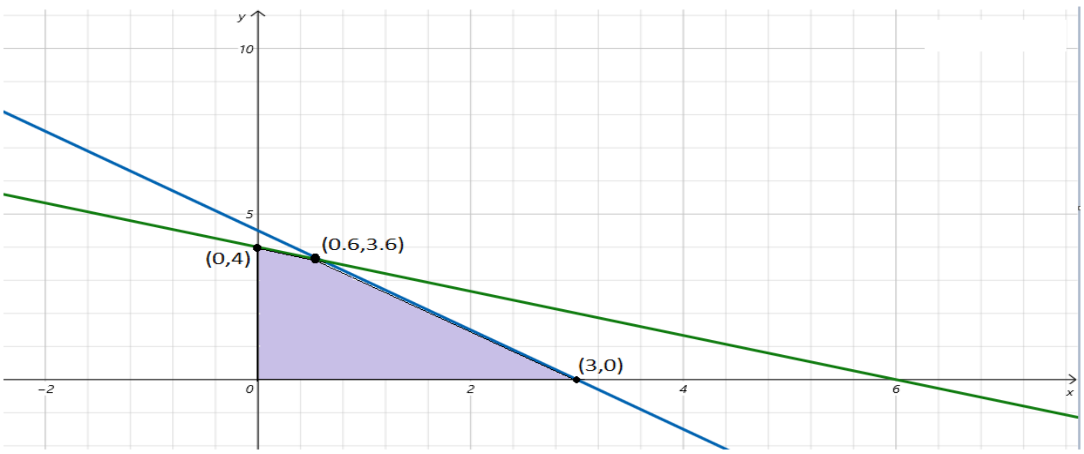
The points satisfying the associated equation are (6,0) and (0,4). [02 Marks]

b)



[0[2 Marks]

c)



[02 Marks]

d) The corner points are $(0,4), (0.6,3.6)$ and $(3,0)$.
At $(0,4) \Longrightarrow z = 50(0) + 70(4) = 280$

At $(0.6,3.6) \Longrightarrow z = 50(0.6) + 70(3.6) = 282$
At $(3,0) \Longrightarrow z = 50(3) + 70(0) = 150$
Hence, the optimal solution is $x = 0.6$ and $y = 3.6$ and minimum $z = 150$.
Thus, the minimum cost is Rs. 150 and the mixture has 0.6kg of Food A and 3.6kg of Food B.

[02 Marks]

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Q.8 **Solution:**

Equation of circle is: $x^2 + y^2 - 2x - 10y + 1 = 0 \quad ---\rightarrow (i)$

And equation of the line intersecting the circle (i) is: $x - 2y + 7 = 0$

$\Longrightarrow x = 2y - 7 \quad ---\rightarrow (ii)$

Substituting Eq. (ii) in (i), we obtain

$\Longrightarrow (2y-7)^2 + y^2 - 2(2y-7) - 10y + 1 = 0$ [02 Marks]

$\Longrightarrow 4y^2 - 28y + 49 + y^2 - 4y + 14s - 10y + 1 = 0$

$\Longrightarrow 5y^2 - 42y + 64 = 0$

$\Longrightarrow y = 2$ and $y = \frac{32}{5}$ [02 Marks]

Substitute the values of y in Eq. (ii), we get

$\Longrightarrow x = -3$ and $x = \frac{29}{5}$

The endpoints of the chord are $A(-3,2)$ and $B\left(\frac{29}{5}, \frac{32}{5}\right)$ [02 Marks]

Now, we shall find the coordinates of the midpoint of the chord,

Midpoint of the chord= $\left(\frac{-3+\frac{29}{5}}{2}, \frac{2+\frac{32}{5}}{2}\right)$

$= \left(\frac{\frac{14}{5}}{2}, \frac{\frac{42}{5}}{2}\right) = \left(\frac{7}{5}, \frac{21}{5}\right)$ [02 Marks]

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