

QUESTION PAPER CODE 65/2/P

EXPECTED ANSWERS/VALUE POINTS

SECTION - A

Marks

1.  $\vec{a} \cdot (\vec{b} \times \vec{a}) = [\vec{a} \ \vec{b} \ \vec{a}] = 0$  1 m

2.  $\vec{a} + \vec{b} = 3\hat{i} + 3\hat{j}$  ½ m

$(\vec{a} + \vec{b}) \cdot \vec{c} = 3$  ½ m

3.  $\frac{x+3}{0} = \frac{y-4}{3} = \frac{z-2}{-1}$  ½ m

D.Rs are 0, 3, -1 ½ m

4.  $|A| = -19$  ½ m

$A^{-1} = -\frac{1}{19} \begin{pmatrix} -2 & -5 \\ -3 & 2 \end{pmatrix}$  ½ m

5.  $\frac{dy}{dx} = c$  ½ m

$y = x \left( \frac{dy}{dx} \right) + \left( \frac{dy}{dx} \right)^2$  ½ m

6.  $\frac{dx}{dy} + \frac{x}{1+y^2} = \frac{\tan^{-1}y}{1+y^2}$  ½ m

I.F. =  $e^{\tan^{-1}y}$  ½ m

SECTION - B

7. Let  $y = \cos^{-1} \left( \frac{x - x^{-1}}{x + x^{-1}} \right) = \cos^{-1} \left( \frac{x^2 - 1}{x^2 + 1} \right)$  1 m

$$= \pi - \cos^{-1} \left( \frac{1-x^2}{1+x^2} \right) \quad 1 \text{ m}$$

$$= \pi - 2 \tan^{-1} x \quad 1 \text{ m}$$

$$\therefore \frac{dy}{dx} = - \frac{2}{1+x^2} \quad 1 \text{ m}$$

8. Let  $y = \cos^{-1} \left\{ \sin \sqrt{\frac{1+x}{2}} \right\} + x^x$

Let  $u = \cos^{-1} \left\{ \sin \sqrt{\frac{1+x}{2}} \right\}$ ;  $v = x^x$

$$\therefore y = u + v$$

$$\frac{dy}{dx} = \frac{du}{dx} + \frac{dv}{dx} \quad \frac{1}{2} \text{ m}$$

$$u = \cos^{-1} \left\{ \sin \sqrt{\frac{1+x}{2}} \right\} = \cos^{-1} \left[ \cos \cdot \left( \frac{\pi}{2} - \sqrt{\frac{1+x}{2}} \right) \right] \quad \frac{1}{2} \text{ m}$$

$$= \frac{\pi}{2} - \sqrt{\frac{1+x}{2}}$$

$$\therefore \frac{du}{dx} = - \frac{1}{2\sqrt{2}\sqrt{1+x}} \dots\dots\dots (i) \quad \frac{1}{2} \text{ m}$$

$$v = x^x$$

$$\therefore \log v = x \log x$$

$$\frac{1}{v} \frac{dv}{dx} = x \cdot \frac{1}{x} + 1 \log x = 1 + \log x$$

$$\frac{dv}{dx} = x^x (1 + \log x) \dots\dots\dots(ii) \quad 1\frac{1}{2} \text{ m}$$

$$\therefore \frac{dy}{dx} = -\frac{1}{2\sqrt{2}\sqrt{1+x}} + x^x (1 + \log x) \quad \frac{1}{2} \text{ m}$$

$$\left(\frac{dy}{dx}\right)_{\text{at } x=1} = -\frac{1}{4} + 1 = \frac{3}{4} \quad \frac{1}{2} \text{ m}$$

9.  $I = \int_0^{\pi/2} \frac{2^{\sin x}}{2^{\sin x} + 2^{\cos x}} dx \dots\dots\dots(i)$

$$= \int_0^{\pi/2} \frac{2^{\sin(\frac{\pi}{2}-x)}}{2^{\sin(\frac{\pi}{2}-x)} + 2^{\cos(\frac{\pi}{2}-x)}} dx \left[ \text{using } \int_0^a f(x) dx = \int_0^a f(a-x) dx \right] \quad 1\frac{1}{2} \text{ m}$$

$$= \int_0^{\pi/2} \frac{2^{\cos x}}{2^{\sin x} + 2^{\cos x}} dx \dots\dots\dots(ii) \quad 1 \text{ m}$$

Adding (i) and (ii),

$$2I = \int_0^{\pi/2} 1 dx = [x]_0^{\pi/2} = \frac{\pi}{2} \quad 1 \text{ m}$$

$$\Rightarrow I = \frac{\pi}{4} \quad \frac{1}{2} \text{ m}$$

OR

$$I = \int_0^{\frac{3}{2}} |x \cos(\pi x)| dx$$

$$= \int_0^{\frac{1}{2}} x \cos \pi x dx - \int_{\frac{1}{2}}^{\frac{3}{2}} x \cos \pi x dx \quad 1 \text{ m}$$

$$= \left[ \frac{x \sin \pi x}{\pi} \right]_0^{\frac{1}{2}} - \int_0^{\frac{1}{2}} \frac{\sin \pi x}{\pi} dx - \left[ \frac{x \sin \pi x}{\pi} \right]_{\frac{1}{2}}^{\frac{3}{2}} + \int_{\frac{1}{2}}^{\frac{3}{2}} \frac{-\sin \pi x}{\pi} dx \quad 1\frac{1}{2} \text{ m}$$

$$\begin{aligned}
&= \frac{1}{2\pi} + \frac{1}{\pi^2} [\cos \pi x]_0^{\frac{1}{2}} + \frac{3}{2\pi} + \frac{1}{2\pi} + \frac{1}{\pi^2} [\cos \pi x]_{\frac{1}{2}}^{\frac{3}{2}} \\
&= \frac{1}{2\pi} - \frac{1}{\pi^2} + \frac{3}{2\pi} + \frac{1}{2\pi} + 0 \qquad 1 \text{ m} \\
&= \frac{5}{2\pi} - \frac{1}{\pi^2} \qquad \frac{1}{2} \text{ m}
\end{aligned}$$

10. 
$$\begin{array}{l}
\text{A} \begin{pmatrix} 25 & 12 & 34 \end{pmatrix} \begin{pmatrix} 20 \\ 15 \\ 5 \end{pmatrix} \\
\text{B} \begin{pmatrix} 22 & 15 & 28 \end{pmatrix} \\
\text{C} \begin{pmatrix} 26 & 18 & 36 \end{pmatrix}
\end{array} \qquad 1\frac{1}{2} \text{ m}$$

$$= \begin{pmatrix} 850 \\ 805 \\ 970 \end{pmatrix} \qquad 1\frac{1}{2} \text{ m}$$

Any relevant value 1 m

11. 
$$\tan^{-1} \left( \sqrt{\frac{a-b}{a+b}} \tan \frac{x}{2} \right) = \cos^{-1} \left\{ \frac{1 - \frac{a-b}{a+b} \tan^2 \frac{x}{2}}{1 + \frac{a-b}{a+b} \tan^2 \frac{x}{2}} \right\} \qquad 1\frac{1}{2} \text{ m}$$

$$= \cos^{-1} \left\{ \frac{a + b - a \tan^2 \frac{x}{2} + b \tan^2 \frac{x}{2}}{a + b + a \tan^2 \frac{x}{2} - b \tan^2 \frac{x}{2}} \right\} \qquad 1 \text{ m}$$

$$= \cos^{-1} \left\{ \frac{a \left( 1 - \tan^2 \frac{x}{2} \right) + b \left( 1 + \tan^2 \frac{x}{2} \right)}{a \left( 1 + \tan^2 \frac{x}{2} \right) + b \left( 1 - \tan^2 \frac{x}{2} \right)} \right\} \qquad \frac{1}{2} \text{ m}$$

$$= \cos^{-1} \left\{ \frac{a \frac{1 - \tan^2 \frac{x}{2}}{1 + \tan^2 \frac{x}{2}} + b}{a + b \frac{1 - \tan^2 \frac{x}{2}}{1 + \tan^2 \frac{x}{2}}} \right\} \quad \frac{1}{2} \text{ m}$$

$$= \cos^{-1} \left\{ \frac{a \cos x + b}{a + b \cos x} \right\} \quad \frac{1}{2} \text{ m}$$

OR

$$\tan^{-1} \left( \frac{x-2}{x-3} \right) + \tan^{-1} \left( \frac{x+2}{x+3} \right) = \frac{\pi}{4}$$

$$\Rightarrow \tan^{-1} \left( \frac{\frac{x-2}{x-3} + \frac{x+2}{x+3}}{1 - \frac{x-2}{x-3} \cdot \frac{x+2}{x+3}} \right) = \frac{\pi}{4} \quad 1\frac{1}{2} \text{ m}$$

$$\Rightarrow \tan^{-1} \left( \frac{2x^2 - 12}{-5} \right) = \frac{\pi}{4} \quad 1\frac{1}{2} \text{ m}$$

$$\Rightarrow \frac{2x^2 - 12}{-5} = 1 \Rightarrow x^2 = \frac{7}{2} \quad \frac{1}{2} \text{ m}$$

$$\Rightarrow x = \sqrt{\frac{7}{2}}$$

For writing no solution as  $|x| < 1$  1/2 m

$$12. \quad A^2 = \begin{pmatrix} 2 & 0 & 1 \\ 2 & 1 & 3 \\ 1 & -1 & 0 \end{pmatrix} \begin{pmatrix} 2 & 0 & 1 \\ 2 & 1 & 3 \\ 1 & -1 & 0 \end{pmatrix} = \begin{pmatrix} 5 & -1 & 2 \\ 9 & -2 & 5 \\ 0 & -1 & -2 \end{pmatrix} \quad 2 \text{ m}$$

$$A^2 - 5A + 16I = \begin{pmatrix} 5 & -1 & 2 \\ 9 & -2 & 5 \\ 0 & -1 & -2 \end{pmatrix} - \begin{pmatrix} 10 & 0 & 5 \\ 10 & 5 & 15 \\ 5 & -5 & 0 \end{pmatrix} + \begin{pmatrix} 16 & 0 & 0 \\ 0 & 16 & 0 \\ 0 & 0 & 16 \end{pmatrix} \quad 1 \text{ m}$$

$$= \begin{pmatrix} 11 & -1 & -3 \\ -1 & 9 & -10 \\ -5 & 4 & 14 \end{pmatrix} \quad 1 \text{ m}$$

13. Taking  $x$  from  $R_2$ ,  $x(x-1)$  from  $R_3$  and  $(x+1)$  from  $C_3$

$$\Delta = x^2(x-1)(x+1) \begin{vmatrix} 1 & x & 1 \\ 2 & x-1 & 1 \\ -3 & x-2 & 1 \end{vmatrix} \quad 2 \text{ m}$$

$$C_2 \rightarrow C_2 - x C_1; \quad C_3 \rightarrow C_3 - C_1,$$

$$= x^2(x^2-1) \begin{vmatrix} 1 & 0 & 0 \\ 2 & -1-x & -1 \\ -3 & 4x-2 & 4 \end{vmatrix} \quad 1 \text{ m}$$

$$= x^2(x^2-1) \begin{vmatrix} -1(1+x) & -1 \\ 4x-2 & 4 \end{vmatrix} \quad \frac{1}{2} \text{ m}$$

$$= 6x^2(1-x^2) \quad \frac{1}{2} \text{ m}$$

14.  $\frac{dx}{dt} = \alpha [-2 \sin 2t \sin 2t + 2 \cos 2t (1 + \cos 2t)] \quad 1 \text{ m}$

$$\frac{dy}{dt} = \beta [2 \sin 2t \cos 2t - (1 - \cos 2t) \cdot 2 \sin 2t] \quad 1 \text{ m}$$

$$\frac{dy}{dx} = \left( \frac{dy}{dt} \right) \Big/ \left( \frac{dx}{dt} \right) = \frac{\beta (2 \sin 4t - 2 \sin 2t)}{\alpha (2 \cos 4t + 2 \cos 2t)} \quad \frac{1}{2} + 1 \text{ m}$$

$$= \frac{\beta}{\alpha} \cdot \frac{2 \cos 3t \sin t}{2 \cos 3t \cos t} = \frac{\beta}{\alpha} \tan t \quad \frac{1}{2} \text{ m}$$

$$15. \quad \text{Here } \begin{vmatrix} b-c-(a-d) & b-a & b+c-(a+d) \\ \alpha-\delta & \alpha & \alpha+\delta \\ \beta-\gamma & \beta & \beta+\gamma \end{vmatrix} \quad 2\frac{1}{2} \text{ m}$$

$$= 2 \begin{vmatrix} b-a & b-a & b+c-a-d \\ \alpha & \alpha & \alpha+\delta \\ \beta & \beta & \beta+\gamma \end{vmatrix} \quad C_1 \rightarrow C_1 + C_3 \quad \frac{1}{2} \text{ m}$$

$$= 0 \quad (\because C_1 \text{ and } C_2 \text{ are identical}) \quad \frac{1}{2} \text{ m}$$

Hence given lines are coplanar 1/2 m

OR

D.R<sup>s</sup> of normal to the plane are 5, -4, 7 1 m

D.R<sup>s</sup> of y-axis : 0, 1, 0 1/2 m

If  $\theta$  is the angle between the plane and y-axis, then

$$\sin \theta = \frac{a_1 a_2 + b_1 b_2 + c_1 c_2}{\sqrt{a_1^2 + b_1^2 + c_1^2} \sqrt{a_2^2 + b_2^2 + c_2^2}} \quad 1 \text{ m}$$

$$= \frac{-4}{3\sqrt{10}} \quad 1 \text{ m}$$

$$\therefore \theta = \sin^{-1}\left(\frac{-4}{3\sqrt{10}}\right)$$

$$\therefore \text{Acute angle is } \sin^{-1}\left(\frac{4}{3\sqrt{10}}\right) \quad \frac{1}{2} \text{ m}$$

16. Let E be the event of getting number greater than 4

$$\therefore P(E) = \frac{1}{3} \quad \text{and} \quad P(\bar{E}) = \frac{2}{3} \quad \frac{1}{2} + \frac{1}{2} \text{ m}$$

Required Probability = P ( $\bar{E} E$  or  $\bar{E} \bar{E} \bar{E} E$  or  $\bar{E} \bar{E} \bar{E} \bar{E} \bar{E} E$  or ....) 1 m

$$= \frac{2}{3} \cdot \frac{1}{3} + \left(\frac{2}{3}\right)^3 \cdot \frac{1}{3} + \left(\frac{2}{3}\right)^5 \cdot \frac{1}{3} + \dots \dots \dots \infty \quad 1 \text{ m}$$

$$= \frac{2}{9} \left[ 1 + \left(\frac{2}{3}\right)^2 + \left(\frac{2}{3}\right)^4 + \dots \dots \dots \infty \right] \quad \frac{1}{2} \text{ m}$$

$$= \frac{2}{9} \times \frac{9}{5} = \frac{2}{5} \quad \frac{1}{2} \text{ m}$$

OR

$$A = \{(5, 6, 1), (5, 6, 2), (5, 6, 3), (5, 6, 4), (5, 6, 5), (5, 6, 6),\}$$

$$P(A) = \frac{6}{6 \times 6 \times 6} = \frac{1}{36}, \quad P(B) = P(\text{getting 3 or 4 on the third throw}) \quad 1\frac{1}{2} \text{ m}$$

$$A \cap B = \{(5, 6, 3), (5, 6, 4)\} \Rightarrow P(A \cap B) = \frac{2}{6 \times 6 \times 6} = \frac{1}{108} \quad 1\frac{1}{2} \text{ m}$$

$$P(B/A) = \frac{P(A \cap B)}{P(A)} = \frac{1}{3} \quad 1 \text{ m}$$

17.  $I = \int (\sqrt{\cot x} + \sqrt{\tan x}) dx$

$$= \int \frac{\cos x + \sin x}{\sqrt{\sin x \cos x}} dx \quad 1 \text{ m}$$

$$= \sqrt{2} \int \frac{(\cos x + \sin x)}{\sqrt{1 - (1 - 2 \sin x \cot x)}} dx \quad 1 \text{ m}$$

$$= \sqrt{2} \int \frac{\cos x + \sin x}{\sqrt{1 - (\sin x - \cos x)^2}} dx \quad \frac{1}{2} \text{ m}$$

Put  $\sin x - \cos x = t \Rightarrow (\cos x + \sin x) dx = dt \quad \frac{1}{2} \text{ m}$

$$\therefore I = \sqrt{2} \int \frac{dt}{\sqrt{1 - t^2}} = \sqrt{2} \sin^{-1} t + c \quad \frac{1}{2} \text{ m}$$

$$= \sqrt{2} \sin^{-1} (\sin x - \cos x) + c \quad \frac{1}{2} \text{ m}$$



$$18. \quad I = \int \frac{x^3 - 1}{x(x^2 + 1)} dx = \int \left( 1 - \frac{x + 1}{x(x^2 + 1)} \right) dx \quad 1 \text{ m}$$

$$= x - \int \frac{x + 1}{x(x^2 + 1)} dx \quad \frac{1}{2} \text{ m}$$

$$= x - I_1$$

$$\text{Let } \frac{x + 1}{x(x^2 + 1)} = \frac{A}{x} + \frac{Bx + C}{x^2 + 1} = \frac{1}{x} + \frac{1 - x}{x^2 + 1} \quad 1 \text{ m}$$

$$\therefore I_1 = \int \frac{1}{x} + \frac{(1 - x)}{x^2 + 1} dx = \log x - \frac{1}{2} \log |x^2 + 1| + \tan^{-1} x \quad 1 \text{ m}$$

$$\therefore I = x - \log |x| + \frac{1}{2} \log |x^2 + 1| - \tan^{-1} x + c \quad \frac{1}{2} \text{ m}$$

$$19. \quad \left. \begin{aligned} \vec{AB} &= -4\hat{i} - 6\hat{j} - 2\hat{k} \\ \vec{AC} &= -\hat{i} + 4\hat{j} + 3\hat{k} \\ \vec{AD} &= -8\hat{i} - \hat{j} + 3\hat{k} \end{aligned} \right\} \quad 1\frac{1}{2} \text{ m}$$

$$\text{For them to be coplanar, } \left[ \vec{AB} \quad \vec{AC} \quad \vec{AD} \right] = 0 \quad 1\frac{1}{2} \text{ m}$$

$$\text{i.e. } \begin{vmatrix} -4 & -6 & -2 \\ -1 & 4 & 3 \\ -8 & -1 & 3 \end{vmatrix} = -60 + 126 - 66 = 0 \quad \frac{1}{2} \text{ m}$$

$$\therefore \text{ Points A, B, C and D are coplanar} \quad \frac{1}{2} \text{ m}$$

### SECTION - C

$$20. \quad \text{Let the equation of line be } y = mx + c \quad 1\frac{1}{2} \text{ m}$$

the line is at unit distance from the origin

i.e.  $\left| \frac{0+c}{\sqrt{1+m^2}} \right| = 1 \Rightarrow c = \sqrt{1+m^2}$  1½ m

$\therefore y = m x + \sqrt{1+m^2}$  ..... (i) 1 m

$\frac{dy}{dx} = m$  1 m

$\therefore y = x \frac{dy}{dx} + \sqrt{1+\left(\frac{dy}{dx}\right)^2}$  1 m

OR

$\frac{dy}{dx} = \frac{x^2 + 3y^2}{2xy} = \frac{1+3\left(\frac{y}{x}\right)^2}{2\left(\frac{y}{x}\right)}$  .....(i) 1 m

Differential equation is homogeneous

Put  $y = v x$

$\Rightarrow \frac{dy}{dx} = v + x \frac{dv}{dx}$  1½ m

$\therefore v + x \frac{dv}{dx} = \frac{1+3v^2}{2v}$  1 m

$\Rightarrow x \frac{dv}{dx} = \frac{1+v^2}{2v}$

$\Rightarrow \int \left( \frac{2v}{1+v^2} \right) dv = \int \frac{dx}{x}$  1 m

$\Rightarrow \log |1+v^2| = \log |x| + \log c$  1 m

$\Rightarrow 1+v^2 = c x$

$\Rightarrow 1+\left(\frac{y}{x}\right)^2 = c x$  or  $x^2 + y^2 = c x^3$  ½ m

21. Equation of plane passing through (1, 0, 0)

$$a(x - 1) + b(y - 0) + c(z - 0) = 0$$

$$\text{or } ax + by + cz - a = 0 \dots\dots\dots (i) \quad 1 \text{ m}$$

Plane (i) passes through (0, 1, 0)

$$b - a = 0 \dots\dots\dots(ii) \quad \frac{1}{2} \text{ m}$$

Angle between plane (i) and plane  $x + y = 3$  is  $\frac{\pi}{4}$  1/2 m

$$\therefore \cos \frac{\pi}{4} = \frac{a + b}{\sqrt{a^2 + b^2 + c^2} \sqrt{2}} \quad 1 \text{ m}$$

$$\Rightarrow \frac{1}{\sqrt{2}} = \frac{a + b}{\sqrt{a^2 + b^2 + c^2} \sqrt{2}} \quad 1 \text{ m}$$

$$\Rightarrow a + b = \sqrt{a^2 + b^2 + c^2}$$

$$\Rightarrow 2a = \sqrt{2a^2 + c^2} \quad (\text{using ii})$$

$$\Rightarrow c = \pm \sqrt{2} a \dots\dots\dots (iii) \quad 1 \text{ m}$$

$\therefore$  Equation (i) becomes

$$a(x - 1) + a(y - 0) \pm \sqrt{2} a(z - 0) = 0$$

$$\Rightarrow x + y \pm \sqrt{2} z - 1 = 0 \quad \frac{1}{2} \text{ m}$$

D.R<sup>rs</sup> of the normal is  $1, 1, \pm \sqrt{2}$  1/2 m

22. Let  $y = (f \circ g)(x)$  [say  $y = h(x)$ ]

$$= f[g(x)] = f(x^3 + 5) \quad 2\frac{1}{2} \text{ m}$$

$$= 2(x^3 + 5) - 3$$

$$= 2x^3 + 7 \quad 2\frac{1}{2} \text{ m}$$

$$\therefore x = \sqrt[3]{\frac{y-7}{2}} = h^{-1}(y) \quad \frac{1}{2} \text{ m}$$

$$\therefore (f \circ g)^{-1} = \sqrt[3]{\frac{x-7}{2}} \quad \frac{1}{2} \text{ m}$$

OR

Let  $(x, y)$  be the identity element in  $Q \times Q$ , then

$$(a, b) * (x, y) = (a, b) = (x, y) * (a, b) \quad \forall (a, b) \in Q \times Q \quad 1\frac{1}{2} \text{ m}$$

$$\Rightarrow (ax, b + ay) = (a, b)$$

$$\Rightarrow a = ax \quad \text{and} \quad b = b + ay$$

$$\Rightarrow x = 1 \quad \text{and} \quad y = 0 \quad 1 \text{ m}$$

$$\therefore (1, 0) \text{ is the identity element in } Q \times Q \quad \frac{1}{2} \text{ m}$$

Let  $(a, b)$  be the invertible element in  $Q \times Q$ , then

there exists  $(\alpha, \beta) \in Q \times Q$  such that

$$(a, b) * (\alpha, \beta) = (\alpha, \beta) * (a, b) = (1, 0) \quad 1\frac{1}{2} \text{ m}$$

$$\Rightarrow (a\alpha, b + a\beta) = (1, 0) \quad 1 \text{ m}$$

$$\Rightarrow \alpha = \frac{1}{a}, \quad \beta = -\frac{b}{a}$$

$$\therefore \text{ the invertible element in } A \text{ is } \left( \frac{1}{a}, -\frac{b}{a} \right) \quad \frac{1}{2} \text{ m}$$

23.  $f(x) = 2x^3 - 9mx^2 + 12m^2x + 1, m > 0$

$$f'(x) = 6x^2 - 18mx + 12m^2 \quad 1 \text{ m}$$

$$f''(x) = 12x - 18m \quad 1 \text{ m}$$

For Max. or minimum,  $f'(x) = 0 \Rightarrow 6x^2 - 18mx + 12m^2 = 0$

$$\Rightarrow (x - 2m)(x - m) = 0$$

$$\Rightarrow x = m \text{ or } 2m \quad 1 \text{ m}$$

At  $x = m$ ,  $f''(x) = 12m - 18m = -ve \Rightarrow x = m$  is a maxima 1 m

At  $x = 2m$ ,  $f''(x) = 24m - 18m = +ve \Rightarrow x = 2m$  is minimum 1 m

$\therefore p = m$  and  $q = 2m$   $\frac{1}{2}$  m

Given  $p^2 = q \Rightarrow m^2 = 2m \Rightarrow m^2 - 2m = 0$

$\Rightarrow m = 0, 2$

$\Rightarrow m = 2$  as  $m > 0$   $\frac{1}{2}$  m

24.  $y = 2 + x$  (i)

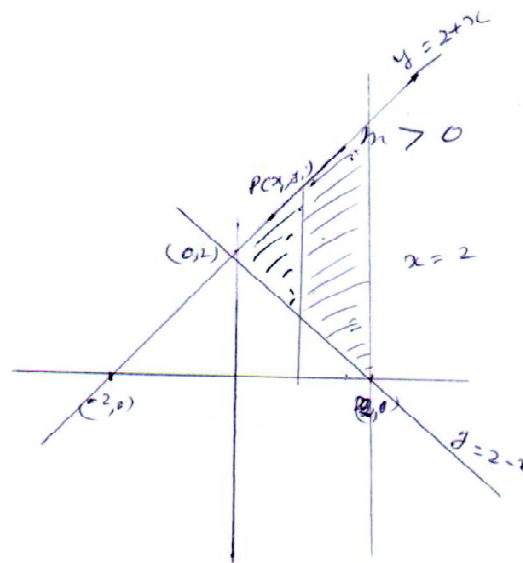
$y = 2 - x$  (ii)

$x = 2$  (iii),

$y_1$  is the value of  $y$  from (i)

and  $y_2$  is the value of  $y$  from (ii)

Required Area =  $\int_0^2 (y_1 - y_2) dx$



correct graph 1+1+1 m

$= \int_0^2 \{(2 + x) - (2 - x)\} dx$

correct shading 1 m

$= 2 \int_0^2 x dx = 2 \left[ \frac{x^2}{2} \right]_0^2$

$\frac{1}{2}$  m

$= 4$  sq. units

$\frac{1}{2}$  m

25. Let  $x$  be the man helpers and  $y$  be the woman helpers

Pay roll :  $Z = 225x + 200y$

1 m

Subject to constraints :

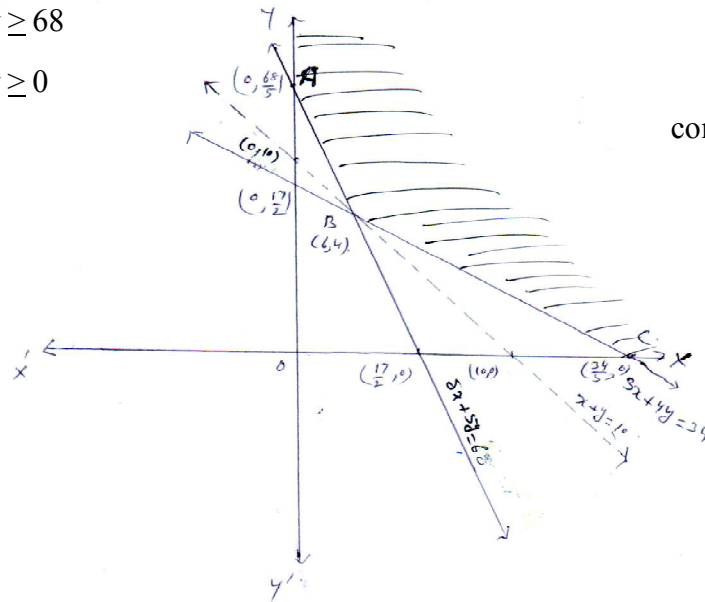
$$x + y \leq 10$$

$$3x + 4y \geq 34$$

$$8x + 5y \geq 68$$

$$x \geq 0, y \geq 0$$

$\frac{1}{2} \times 4 = 2$  m



correct graph : 2 m

At A  $\left(0, \frac{68}{5}\right)$ ,  $Z(A) = \text{Rs. } 2720$

At B  $(6, 4)$ ,  $Z(B) = \text{Rs. } 2150$  Minimum

$\frac{1}{2}$  m

At C  $\left(\frac{34}{5}, 0\right)$ ,  $Z(C) = \text{Rs. } 2550$

Minimum  $Z = \text{Rs. } 2150$  at  $(6, 4)$

$\frac{1}{2}$  m

[Feasible region is unbounded and to check minimum

of  $Z$ ,  $225x + 200y < 2150$

corresponding line is outside of the shaded region]

26. Let  $E_1, E_2$  and  $E$  be the events such that

$E_1$  : students residing in hostel

$E_2$  : students residing outside hostel

$\frac{1}{2}$  m

$E_3$  : students getting 'A' grade

$$\therefore P(E_1) = \frac{40}{100}, \quad P(E/E_1) = \frac{50}{100}$$

2 m

$$P(E_2) = \frac{60}{100}, \quad P(E/E_2) = \frac{30}{100}$$

$$P(E_1/E) = \frac{P(E_1) \cdot P(E/E_1)}{P(E_1) \cdot P(E/E_1) + P(E_2) \cdot P(E/E_2)}$$

1 m

$$= \frac{\frac{40}{100} \times \frac{50}{100}}{\frac{40}{100} \times \frac{50}{100} + \frac{30}{100} \times \frac{60}{100}}$$

1 m

$$= \frac{10}{19}$$

½ m