



SUMMER – 18 EXAMINATION

Subject Name: Basic Mathematics

Model Answer

Subject Code:

22103

Q. No.	Sub Q.N.	Answers	Marking Scheme
1.	b)	$A = 12$	½
	c)	Without using calculator, find the value of $\sec(3660^\circ)$	02
	Ans	$\sec(3660^\circ) = \sec(40 \times 90^\circ + 60^\circ) \text{ or } \sec\left(40 \times \frac{\pi}{2} + 60^\circ\right)$ $= \sec 60^\circ$ $= 2$	1 ½ ½
	d)	The length of one side of the rectangle is twice the length of its adjacent side. If the perimeter of rectangle is 60 cms, find the area of the rectangle.	02
	Ans	Let adjacent side = x \therefore other side = $2x$ perimeter = $2(x + 2x) = 60$ $\therefore x = 10$ $\therefore l = \text{length} = 2x = 20$ $\therefore b = \text{breadth} = x = 10$ Area = $l \times b$ $= 20 \times 10 = 200$	½ ½ 1
	e)	Find the surface area of a cuboid of dimensions 26 cms ; 20 cms and 12 cms.	02
Ans	Let $l = 26, b = 20, h = 12$ Surface Area = $2[lb + bh + hl]$ $= 2[26 \times 20 + 20 \times 12 + 12 \times 26]$ $= 2144$	1 1	
f)	Find range and coefficient of range for the data: 120, 50, 90, 100, 180, 200, 150, 40, 80	02	
Ans	Range = $L - S$ $= 200 - 40$ $= 160$ coefficient of range = $\frac{L - S}{L + S}$ $= \frac{200 - 40}{200 + 40}$	1 ½	



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1.	f)	coefficient of range = 0.667	½
	g)	If coefficient of variation of a distribution is 75% and standard deviation is 24, find its mean.	02
	Ans	coefficient of variation = $\frac{\sigma}{x} \times 100$ $75 = \frac{24}{x} \times 100$ $x = \frac{24 \times 100}{75}$ $x = 32$	½ ½ 1
2.		Attempt any three of the following :	12
	a)	If $A = \begin{bmatrix} 3 & -1 \\ 2 & 4 \end{bmatrix}$, $B = \begin{bmatrix} 1 & 2 \\ -3 & 0 \end{bmatrix}$. Find X such that $2X + 3A - 4B = I$.	04
	Ans	$2X + 3A - 4B = I$ $2X + 3 \begin{bmatrix} 3 & -1 \\ 2 & 4 \end{bmatrix} - 4 \begin{bmatrix} 1 & 2 \\ -3 & 0 \end{bmatrix} = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ $2X + \begin{bmatrix} 9 & -3 \\ 6 & 12 \end{bmatrix} - \begin{bmatrix} 4 & 8 \\ -12 & 0 \end{bmatrix} = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ $2X + \begin{bmatrix} 5 & -11 \\ 18 & 12 \end{bmatrix} = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ $2X = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} - \begin{bmatrix} 5 & -11 \\ 18 & 12 \end{bmatrix}$ $2X = \begin{bmatrix} -4 & 11 \\ -18 & -11 \end{bmatrix}$ $\therefore X = \frac{1}{2} \begin{bmatrix} -4 & 11 \\ -18 & -11 \end{bmatrix} \quad \text{OR} \quad X = \begin{bmatrix} -2 & \frac{11}{2} \\ -9 & \frac{-11}{2} \end{bmatrix}$	1 1 1 1

OUR CENTERS :

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2.	b)	Resolve into partial fractions $\frac{x^2+1}{x(x^2-1)}$	04
	Ans	$\frac{x^2+1}{x(x+1)(x-1)} = \frac{A}{x} + \frac{B}{x+1} + \frac{C}{x-1}$ $\therefore x^2+1 = A(x-1)(x+1) + B(x)(x-1) + C(x)(x+1)$ <p>Put $x = 0$</p> $\therefore 0+1 = A(0-1)(0+1)$ $\boxed{A = -1}$ <p>Put $x = -1$</p> $\therefore (-1)^2 + 1 = B(-1)(-1-1)$ $\boxed{B = 1}$ <p>Put $x = 1$</p> $\therefore 1^2 + 1 = C(1)(1+1)$ $\boxed{C = 1}$ $\therefore \frac{x^2+1}{x(x+1)(x-1)} = \frac{-1}{x} + \frac{1}{x+1} + \frac{1}{x-1}$	<p>½</p> <p>1</p> <p>1</p> <p>1</p> <p>½</p>
	c)	<p>The voltage in an electric circuit are related by following equations: $V_1 + V_2 + V_3 = 9$; $V_1 - V_2 + V_3 = 3$; $V_1 + V_2 - V_3 = 1$ find V_1, V_2 and V_3 by using Cramer's rule.</p>	04
	Ans	$D = \begin{vmatrix} 1 & 1 & 1 \\ 1 & -1 & 1 \\ 1 & 1 & -1 \end{vmatrix} = 1(1-1) - 1(-1-1) + 1(1+1) = 4$ $D_{V_1} = \begin{vmatrix} 9 & 1 & 1 \\ 3 & -1 & 1 \\ 1 & 1 & -1 \end{vmatrix} = 9(1-1) - 1(-3-1) + 1(3+1) = 8$ $\therefore V_1 = \frac{D_{V_1}}{D} = \frac{8}{4} = 2$ $D_{V_2} = \begin{vmatrix} 1 & 9 & 1 \\ 1 & 3 & 1 \\ 1 & 1 & -1 \end{vmatrix} = 1(-3-1) - 9(-1-1) + 1(1-3) = 12$	<p>1</p> <p>1</p>

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2.	c)	$\therefore V_2 = \frac{D_{V_2}}{D} = \frac{12}{4} = 3$ $D_{V_3} = \begin{vmatrix} 1 & 1 & 9 \\ 1 & -1 & 3 \\ 1 & 1 & 1 \end{vmatrix} = 1(-1-3) - 1(1-3) + 9(1+1) = 16$ $\therefore V_3 = \frac{D_{V_3}}{D} = \frac{16}{4} = 4$	1																													
	d)	<p>Calculate the mean deviation about the mean of the following data: 3, 6, 5, 7, 10, 12, 15, 18.</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>x_i</th> <th>$d_i = x_i - \bar{x}$</th> <th>d_i</th> </tr> </thead> <tbody> <tr><td>3</td><td>-6.5</td><td>6.5</td></tr> <tr><td>5</td><td>-4.5</td><td>4.5</td></tr> <tr><td>6</td><td>-3.5</td><td>3.5</td></tr> <tr><td>7</td><td>-2.5</td><td>2.5</td></tr> <tr><td>10</td><td>0.5</td><td>0.5</td></tr> <tr><td>12</td><td>2.5</td><td>2.5</td></tr> <tr><td>15</td><td>5.5</td><td>5.5</td></tr> <tr><td>18</td><td>8.5</td><td>8.5</td></tr> <tr><td>$\sum x_i = 76$</td><td></td><td>$\sum d_i = 34$</td></tr> </tbody> </table> <p>where Mean $\bar{x} = \frac{\sum x_i}{N} = \frac{76}{8}$ $\bar{x} = 9.5$</p> <p>\therefore Mean deviation about mean = $\frac{\sum d_i }{N}$ $= \frac{34}{8} = 4.25$</p>	x_i	$d_i = x_i - \bar{x}$	$ d_i $	3	-6.5	6.5	5	-4.5	4.5	6	-3.5	3.5	7	-2.5	2.5	10	0.5	0.5	12	2.5	2.5	15	5.5	5.5	18	8.5	8.5	$\sum x_i = 76$		$\sum d_i = 34$
x_i	$d_i = x_i - \bar{x}$	$ d_i $																														
3	-6.5	6.5																														
5	-4.5	4.5																														
6	-3.5	3.5																														
7	-2.5	2.5																														
10	0.5	0.5																														
12	2.5	2.5																														
15	5.5	5.5																														
18	8.5	8.5																														
$\sum x_i = 76$		$\sum d_i = 34$																														
3.	a)	<p>Attempt any three of the following :</p> <p>Without using calculator find the value of $\cos 570^\circ \sin 510^\circ + \sin(-330^\circ) \cos(-390^\circ)$</p> <p>Ans $\cos 570^\circ = \cos(6 \times 90^\circ + 30^\circ)$</p>	12 04																													



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3.	a)	$\cos 570^\circ = -\cos 30^\circ = -\frac{\sqrt{3}}{2}$	½
		$\sin 510^\circ = \sin(6 \times 90^\circ - 30^\circ)$ $= \sin 30^\circ = \frac{1}{2}$	½
		$\sin(-330^\circ) = -\sin(330^\circ)$ $= -\sin(4 \times 90^\circ - 30^\circ) = -(-\sin 30^\circ) = \frac{1}{2}$	½
		$\cos(-390^\circ) = \cos 390^\circ$ $= \cos(4 \times 90^\circ + 30^\circ) = \cos 30^\circ = \frac{\sqrt{3}}{2}$	½
		$\therefore \cos 570^\circ \sin 510^\circ + \sin(-330^\circ) \cos(-390^\circ)$ $= \left(-\frac{\sqrt{3}}{2}\right) \left(\frac{1}{2}\right) + \left(\frac{1}{2}\right) \left(\frac{\sqrt{3}}{2}\right)$ $= 0$	1
	b)	<p>Prove that $\frac{\sin 4\theta + \sin 2\theta}{1 + \cos 2\theta + \cos 4\theta} = \tan 2\theta$</p>	04
	Ans	$\text{LHS} = \frac{\sin 4\theta + \sin 2\theta}{1 + \cos 4\theta + \cos 2\theta}$ $= \frac{2 \cdot \sin 2\theta \cdot \cos 2\theta + \sin 2\theta}{2 \cos^2 2\theta + \cos 2\theta}$ $= \frac{\sin 2\theta (2 \cos 2\theta + 1)}{\cos 2\theta (2 \cos 2\theta + 1)}$ $= \tan 2\theta$	2
			1
			1
	c)	<p>Prove that $\frac{\sin 3A - \sin A}{\cos 3A + \cos A} = \tan A$</p>	04
	Ans	$\text{LHS} = \frac{\sin 3A - \sin A}{\cos 3A + \cos A}$	



SUMMER – 18 EXAMINATION

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3.	c)	$\frac{2 \cdot \cos\left(\frac{3A+A}{2}\right) \cdot \sin\left(\frac{3A-A}{2}\right)}{2 \cdot \cos\left(\frac{3A+A}{2}\right) \cdot \cos\left(\frac{3A-A}{2}\right)}$ $= \frac{2 \cos 2A \cdot \sin A}{2 \cos 2A \cdot \cos A}$ $= \tan A$ <p>=RHS</p>	2 1 1
	d)	<p>Prove that $\tan^{-1} \frac{1}{4} + \tan^{-1} \frac{2}{9} = \cot^{-1} 2$</p> <p>Ans $\tan^{-1} \frac{1}{4} + \tan^{-1} \frac{2}{9}$</p> $= \tan^{-1} \left[\frac{\frac{1}{4} + \frac{2}{9}}{1 - \frac{1}{4} \times \frac{2}{9}} \right]$ $= \tan^{-1} \left(\frac{1}{2} \right)$ $= \cot^{-1} 2$ <p>$\therefore \tan^{-1} \frac{1}{4} + \tan^{-1} \frac{2}{9} = \cot^{-1} 2$</p>	04 2 1 1
4.		<p>Attempt any three of the following :</p>	12
	a)	<p>Find x and y if</p>	04



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4.	a)	$\left\{ 4 \begin{bmatrix} 1 & 2 & 0 \\ 2 & -1 & 3 \end{bmatrix} - 2 \begin{bmatrix} 1 & 3 & -1 \\ 2 & -3 & 4 \end{bmatrix} \right\} \begin{bmatrix} 2 \\ 0 \\ -1 \end{bmatrix} = \begin{bmatrix} x \\ y \end{bmatrix}$	
	Ans	$\left\{ 4 \begin{bmatrix} 1 & 2 & 0 \\ 2 & -1 & 3 \end{bmatrix} - 2 \begin{bmatrix} 1 & 3 & -1 \\ 2 & -3 & 4 \end{bmatrix} \right\} \begin{bmatrix} 2 \\ 0 \\ -1 \end{bmatrix} = \begin{bmatrix} x \\ y \end{bmatrix}$	
		$\left\{ \begin{bmatrix} 4 & 8 & 0 \\ 8 & -4 & 12 \end{bmatrix} - \begin{bmatrix} 2 & 6 & -2 \\ 4 & -6 & 8 \end{bmatrix} \right\} \begin{bmatrix} 2 \\ 0 \\ -1 \end{bmatrix} = \begin{bmatrix} x \\ y \end{bmatrix}$	1
		$\begin{bmatrix} 2 & 2 & 2 \\ 4 & 2 & 4 \end{bmatrix} \begin{bmatrix} 2 \\ 0 \\ -1 \end{bmatrix} = \begin{bmatrix} x \\ y \end{bmatrix}$	1
		$\begin{bmatrix} 4+0-2 \\ 8+0-4 \end{bmatrix} = \begin{bmatrix} x \\ y \end{bmatrix}$	1
		$\begin{bmatrix} 2 \\ 4 \end{bmatrix} = \begin{bmatrix} x \\ y \end{bmatrix}$	1
		$\therefore x = 2, y = 4$	
	b)	Resolve into partial fractions $\frac{2x+1}{(x-1)(x^2+1)}$	04
	Ans	$\frac{2x+1}{(x-1)(x^2+1)} = \frac{A}{x-1} + \frac{Bx+C}{x^2+1}$	1/2
		$\therefore 2x+1 = (x^2+1)A + (x-1)(Bx+C)$	
		Put $x = 1$	
		$\therefore 2(1)+1 = (1^2+1)A$	
		$\therefore 3 = 2A$	
		$\therefore A = \frac{3}{2}$	
		Put $x = 0$,	
		$\therefore 2(0)+1 = (0+1)A + (0-1)(B(0)+C)$	
		$\therefore 1 = A - C$	1



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4.	c)	$\cos 20^\circ \cdot \cos 40^\circ \cdot \cos 60^\circ \cdot \cos 80^\circ = \frac{1}{8} \left[\cos 80^\circ + \cos (180 - 80^\circ) + \frac{1}{2} \right]$ $= \frac{1}{8} \left[\cos 80^\circ - \cos (80^\circ) + \frac{1}{2} \right]$ $= \frac{1}{16}$	<p>1/2</p> <p>1/2</p> <p>1/2</p>
	d)	<p>If $\tan \frac{\theta}{2} = \frac{2}{3}$ find the value of $2 \sin \theta + 3 \cos \theta$.</p> <p>Ans $2 \sin \theta + 3 \cos \theta$</p> $= 2 \left(\frac{2 \tan \frac{\theta}{2}}{1 + \tan^2 \frac{\theta}{2}} \right) + 3 \left(\frac{1 - \tan^2 \frac{\theta}{2}}{1 + \tan^2 \frac{\theta}{2}} \right)$ $= 2 \left(\frac{2 \times \frac{2}{3}}{1 + \left(\frac{2}{3}\right)^2} \right) + 3 \left(\frac{1 - \left(\frac{2}{3}\right)^2}{1 + \left(\frac{2}{3}\right)^2} \right)$ $= 3$	<p>04</p> <p>2</p> <p>1</p> <p>1</p>
	e)	<p>If A and B are obtuse angles and $\sin A = \frac{5}{13}$ and $\cos B = -\frac{4}{5}$ then find $\sin(A+B)$.</p> <p>Ans $\cos^2 A = 1 - \sin^2 A$</p> $= 1 - \left(\frac{5}{13}\right)^2$ $= 1 - \frac{25}{169} = \frac{144}{169}$ $\cos A = \pm \frac{12}{13}$ <p>$\therefore \cos A = -\frac{12}{13}$ ($\because A$ is obtuse angle)</p> $\sin^2 B = 1 - \cos^2 B$ $= 1 - \left(-\frac{4}{5}\right)^2$	<p>04</p> <p>1</p>



SUMMER – 18 EXAMINATION

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4.	e)	$\sin^2 B = 1 - \frac{16}{25} = \frac{9}{25}$ $\sin B = \pm \frac{3}{5}$ $\therefore \sin B = \frac{3}{5} \quad (\because A \text{ is obtuse angle})$ $\therefore \sin(A+B) = \sin A \cos B + \cos A \sin B$ $= \left(\frac{5}{13}\right) \times \left(-\frac{4}{5}\right) + \left(-\frac{12}{13}\right) \times \left(\frac{3}{5}\right)$ $= -\frac{56}{65}$	1 1 1
5.		<p>Attempt any two of the following :</p> <p>a) Attempt the following :</p> <p>i) Find the length of the perpendicular from the point (5,4) on the straight line $2x + y = 34$.</p> <p>Ans</p> $p = \frac{ ax_1 + by_1 + c }{\sqrt{a^2 + b^2}}$ $= \frac{ 2(5) + 1(4) - 34 }{\sqrt{(2)^2 + (1)^2}}$ $= \frac{ 10 + 4 - 34 }{\sqrt{5}}$ $= \frac{20}{\sqrt{5}} \quad \text{OR} \quad 8.94$	12 06 03 2 1
		<p>ii) Find the equation of the line passing through (3,-4) and having slope $\frac{3}{2}$.</p> <p>Ans</p> <p>Point $= (x_1, y_1) = (3, -4)$ & slope $= \frac{3}{2}$</p> <p>\therefore equation of line is,</p> $y - y_1 = m(x - x_1)$	03



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5.	a)ii)	$\therefore y - (-4) = \frac{3}{2}(x - 3)$ $\therefore 2(y + 4) = 3(x - 3)$ $\therefore 3x - 2y - 17 = 0$ <p>-----</p>	1 1 1
	b)	Attempt the following:	06
	i)	Find the equation of line passing through (3, 4) and perpendicular to the line $2x - 4y + 5 = 0$.	03
	Ans	Point $(x_1, y_1) = (3, 4)$ Slope of the line $2x - 4y + 5 = 0$ is, $m = -\frac{a}{b} = -\frac{2}{-4} = \frac{1}{2}$ $\therefore \text{Slope of the required line is,}$ $m' = -\frac{1}{m} = -2$ $\therefore \text{equation is,}$ $y - y_1 = m'(x - x_1)$ $\therefore y - 4 = -2(x - 3)$ $\therefore 2x + y - 10 = 0$ <p>-----</p>	1 1 1
	ii)	Find the acute angle between the lines $3x - y = 4$ and $2x + y = 3$.	03
	Ans	For $3x - y = 4$, slope $m_1 = -\frac{a}{b} = -\frac{3}{-1} = 3$ For $2x + y = 3$, slope $m_2 = -\frac{a}{b} = -\frac{2}{1} = -2$ $\therefore \tan \theta = \frac{ m_1 - m_2 }{ 1 + m_1 m_2 }$ $= \frac{ 3 - (-2) }{ 1 + 3 \times (-2) }$ $= 1$	$\frac{1}{2}$ $\frac{1}{2}$ 1 $\frac{1}{2}$



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5.	b)ii)	$\therefore \theta = \tan^{-1}(1)$ $\therefore \theta = \frac{\pi}{4}$ or 45°	½											
	c)	Attempt the following:	06											
	i)	Find the capacity of a cylindrical water tank whose radius is 2.1m and length is 5m. Ans Let $r = 2.1$ & $h = 5$ capacity of a cylindrical water tank = volume of cylinder $\therefore V = \pi r^2 h$ $= \frac{22}{7} \times (2.1)^2 \times 5$ $= 69.3$	03 2 1											
	ii)	External dimensions of a wooden cuboid are 30 cm × 25 cm × 20 cm. If the thickness of wood is 2 cm all round. Find the volume of the wood contained in the cuboid formed. Ans External length of the cuboid = 30 cm External breadth of the cuboid = 25 cm External height of the cuboid = 20 cm External volume of the cuboid = $(30 \times 25 \times 20) \text{ cm}^3$ $= 15000 \text{ cm}^3$ Internal volume of the cuboid = $(26 \times 21 \times 16) \text{ cm}^3$ $= 8736 \text{ cm}^3$ Volume of wood = External Volume – Internal Volume $= 15000 \text{ cm}^3 - 8736 \text{ cm}^3$ $= 6264 \text{ cm}^3$	03 1 1 1											
6.		Attempt any two of the following :	12											
	a)	Calculate the mean, standard deviation and co-efficient of variance of the following data: <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td>Class Interval</td> <td>0-10</td> <td>10-20</td> <td>20-30</td> <td>30-40</td> <td>40-50</td> </tr> <tr> <td>Frequency</td> <td>03</td> <td>05</td> <td>08</td> <td>03</td> <td>01</td> </tr> </table>	Class Interval	0-10	10-20	20-30	30-40	40-50	Frequency	03	05	08	03	01
Class Interval	0-10	10-20	20-30	30-40	40-50									
Frequency	03	05	08	03	01									



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6.	a)	<table border="1"> <thead> <tr> <th>Class Interval</th> <th>x_i</th> <th>f_i</th> <th>$f_i x_i$</th> <th>$d_i = \frac{x_i - a}{h}$</th> <th>$f_i d_i$</th> <th>d_i^2</th> <th>$f_i d_i^2$</th> </tr> </thead> <tbody> <tr> <td>0-10</td> <td>5</td> <td>3</td> <td>15</td> <td>-2</td> <td>-6</td> <td>4</td> <td>12</td> </tr> <tr> <td>10-20</td> <td>15</td> <td>5</td> <td>75</td> <td>-1</td> <td>-5</td> <td>1</td> <td>5</td> </tr> <tr> <td>20-30</td> <td>25</td> <td>8</td> <td>200</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> </tr> <tr> <td>30-40</td> <td>35</td> <td>3</td> <td>105</td> <td>1</td> <td>3</td> <td>1</td> <td>3</td> </tr> <tr> <td>40-50</td> <td>45</td> <td>1</td> <td>45</td> <td>2</td> <td>2</td> <td>4</td> <td>4</td> </tr> <tr> <td></td> <td></td> <td>20</td> <td>440</td> <td></td> <td>-6</td> <td></td> <td>24</td> </tr> </tbody> </table> <p>Mean $\bar{x} = \frac{\sum f_i x_i}{N} = \frac{440}{20} = 22$</p> <p>S.D. = $\sigma = \sqrt{\frac{\sum f_i d_i^2}{N} - \left(\frac{\sum f_i d_i}{N}\right)^2} \times h$</p> <p>$= \sqrt{\frac{24}{20} - \left(\frac{-6}{20}\right)^2} \times 10$</p> <p>$= 10.54$</p> <p>Coefficient of variance = $\frac{\sigma}{\bar{x}} \times 100$</p> <p>$= \frac{10.54}{22} \times 100$</p> <p>$= 47.91$</p> <p>OR</p>	Class Interval	x_i	f_i	$f_i x_i$	$d_i = \frac{x_i - a}{h}$	$f_i d_i$	d_i^2	$f_i d_i^2$	0-10	5	3	15	-2	-6	4	12	10-20	15	5	75	-1	-5	1	5	20-30	25	8	200	0	0	0	0	30-40	35	3	105	1	3	1	3	40-50	45	1	45	2	2	4	4			20	440		-6		24	<p>3</p> <p>1</p> <p>1</p> <p>1</p>
Class Interval	x_i	f_i	$f_i x_i$	$d_i = \frac{x_i - a}{h}$	$f_i d_i$	d_i^2	$f_i d_i^2$																																																				
0-10	5	3	15	-2	-6	4	12																																																				
10-20	15	5	75	-1	-5	1	5																																																				
20-30	25	8	200	0	0	0	0																																																				
30-40	35	3	105	1	3	1	3																																																				
40-50	45	1	45	2	2	4	4																																																				
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6.	a)	<table border="1"> <thead> <tr> <th>Class Interval</th> <th>x_i</th> <th>f_i</th> <th>$f_i x_i$</th> <th>x_i^2</th> <th>$f_i x_i^2$</th> </tr> </thead> <tbody> <tr> <td>0-10</td> <td>5</td> <td>3</td> <td>15</td> <td>25</td> <td>75</td> </tr> <tr> <td>10-20</td> <td>15</td> <td>5</td> <td>75</td> <td>225</td> <td>1125</td> </tr> <tr> <td>20-30</td> <td>25</td> <td>8</td> <td>200</td> <td>625</td> <td>5000</td> </tr> <tr> <td>30-40</td> <td>35</td> <td>3</td> <td>105</td> <td>1225</td> <td>3675</td> </tr> <tr> <td>40-50</td> <td>45</td> <td>1</td> <td>45</td> <td>2025</td> <td>2025</td> </tr> <tr> <td></td> <td></td> <td>20</td> <td>440</td> <td></td> <td>11900</td> </tr> </tbody> </table> <p>Mean $\bar{x} = \frac{\sum f_i x_i}{N} = \frac{440}{20} = 22$</p> <p>S.D. $\sigma = \sqrt{\frac{\sum f_i x_i^2}{N} - (\bar{x})^2}$ $= \sqrt{\frac{11900}{20} - (22)^2}$ $\sigma = 10.54$</p> <p>Coefficient of variance $= \frac{\sigma}{\bar{x}} \times 100$ $= \frac{10.54}{22} \times 100$ $= 47.91$</p>	Class Interval	x_i	f_i	$f_i x_i$	x_i^2	$f_i x_i^2$	0-10	5	3	15	25	75	10-20	15	5	75	225	1125	20-30	25	8	200	625	5000	30-40	35	3	105	1225	3675	40-50	45	1	45	2025	2025			20	440		11900	06 3 1 1 1
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OUR CENTERS :

KALYAN | DOMBIVLI | THANE | NERUL | DADAR

Contact - 9136008228



SUMMER – 18 EXAMINATION

Subject Name: Basic Mathematics

Model Answer

Subject Code:

22103

Q. No.	Sub Q.N.	Answers	Marking Scheme
6.	c)	<p>Solve the following equations by matrix inversion method :</p> $x + 3y + 3z = 12, x + 4y + 4z = 15, x + 3y + 4z = 13$ <p>Ans Let $A = \begin{bmatrix} 1 & 3 & 3 \\ 1 & 4 & 4 \\ 1 & 3 & 4 \end{bmatrix}$, $B = \begin{bmatrix} 12 \\ 15 \\ 13 \end{bmatrix}$, $X = \begin{bmatrix} x \\ y \\ z \end{bmatrix}$</p> $ A = \begin{vmatrix} 1 & 3 & 3 \\ 1 & 4 & 4 \\ 1 & 3 & 4 \end{vmatrix}$ $ A = 1(16 - 12) - 3(4 - 4) + 3(3 - 4)$ $ A = 4 - 0 - 3$ $\therefore A = 1 \neq 0$ $\therefore A^{-1} \text{ exists}$ <p>Matrix of minors = $\begin{bmatrix} \begin{vmatrix} 4 & 4 \\ 3 & 4 \end{vmatrix} & \begin{vmatrix} 1 & 4 \\ 1 & 4 \end{vmatrix} & \begin{vmatrix} 1 & 4 \\ 1 & 3 \end{vmatrix} \\ \begin{vmatrix} 3 & 3 \\ 3 & 4 \end{vmatrix} & \begin{vmatrix} 1 & 3 \\ 1 & 4 \end{vmatrix} & \begin{vmatrix} 1 & 3 \\ 1 & 3 \end{vmatrix} \\ \begin{vmatrix} 3 & 3 \\ 4 & 4 \end{vmatrix} & \begin{vmatrix} 1 & 3 \\ 1 & 4 \end{vmatrix} & \begin{vmatrix} 1 & 3 \\ 1 & 4 \end{vmatrix} \end{bmatrix}$ $= \begin{bmatrix} 4 & 0 & -1 \\ 3 & 1 & 0 \\ 0 & 1 & 1 \end{bmatrix}$ <p>Matrix of cofactors = $\begin{bmatrix} 4 & 0 & -1 \\ -3 & 1 & 0 \\ 0 & -1 & 1 \end{bmatrix}$</p> <p>OR</p> $C_{11} = + \begin{vmatrix} 4 & 4 \\ 3 & 4 \end{vmatrix} = 16 - 12 = 4, C_{12} = - \begin{vmatrix} 1 & 4 \\ 1 & 4 \end{vmatrix} = -(4 - 4) = 0$ $C_{13} = + \begin{vmatrix} 1 & 4 \\ 1 & 3 \end{vmatrix} = 3 - 4 = -1, C_{21} = - \begin{vmatrix} 3 & 3 \\ 3 & 4 \end{vmatrix} = -(12 - 9) = -3$ $C_{22} = + \begin{vmatrix} 1 & 3 \\ 1 & 4 \end{vmatrix} = 4 - 3 = 1, C_{23} = - \begin{vmatrix} 1 & 3 \\ 1 & 3 \end{vmatrix} = -(3 - 3) = 0$ </p>	<p>06</p> <p>1</p> <p>1</p> <p>1</p>



SUMMER – 18 EXAMINATION

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Q. No.	Sub Q. N.	Answers	Marking Scheme
6.	c)	$C_{31} = + \begin{vmatrix} 3 & 3 \\ 4 & 4 \end{vmatrix} = 12 - 12 = 0, \quad C_{32} = - \begin{vmatrix} 1 & 3 \\ 1 & 4 \end{vmatrix} = -(4 - 3) = -1$ $C_{33} = + \begin{vmatrix} 1 & 3 \\ 1 & 4 \end{vmatrix} = 4 - 3 = 1,$ $\text{Matrix of cofactors} = \begin{bmatrix} 4 & 0 & -1 \\ -3 & 1 & 0 \\ 0 & -1 & 1 \end{bmatrix}$ $\text{Adj.}A = \begin{bmatrix} 4 & -3 & 0 \\ 0 & 1 & -1 \\ -1 & 0 & 1 \end{bmatrix}$ $A^{-1} = \frac{1}{ A } \text{Adj.}A$ $= \frac{1}{1} \begin{bmatrix} 4 & -3 & 0 \\ 0 & 1 & -1 \\ -1 & 0 & 1 \end{bmatrix}$ $\therefore X = A^{-1}B$ $\begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 4 & -3 & 0 \\ 0 & 1 & -1 \\ -1 & 0 & 1 \end{bmatrix} \begin{bmatrix} 12 \\ 15 \\ 13 \end{bmatrix}$ $\begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 48 - 45 + 0 \\ 0 + 15 - 13 \\ -12 + 0 + 13 \end{bmatrix}$ $\begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 3 \\ 2 \\ 1 \end{bmatrix}$ $\therefore x = 3, y = 2, z = 1.$	<p>1</p> <p>1</p> <p>½</p> <p>½</p> <p>1</p> <p>1</p>



Important Note

In the solution of the question paper, wherever possible all the possible alternative methods of solution are given for the sake of convenience. Still student may follow a method other than the given herein. In such case, first see whether the method falls within the scope of the curriculum, and then only give appropriate marks in accordance with the scheme of marking.

Pinnacle