Winter – 2012 Examination

Que. No.	Sub. Que.	Model answers	Marks	Total Marks
1)	a)	$\begin{vmatrix} 3 & -5 & -1 \\ 1 & 3 & 5 \\ -5 & 1 & 3 \end{vmatrix} = 3(9-5)+5(3+25)-1(1+15)$	1	
		$=136$	1	**2**
	b)	$3A-2B=3\begin{bmatrix} 2 & 3 \\ 4 & 7 \end{bmatrix}-2\begin{bmatrix} 1 & 3 \\ 4 & 6 \end{bmatrix}$		
		$=\begin{bmatrix} 6 & 9 \\ 12 & 21 \end{bmatrix}-\begin{bmatrix} 2 & 6 \\ 8 & 12 \end{bmatrix}$	1	
		$=\begin{bmatrix} 4 & 3 \\ 4 & 9 \end{bmatrix}$	1	**2**
		OR		
		$3A=3\begin{bmatrix} 2 & 3 \\ 4 & 7 \end{bmatrix}=\begin{bmatrix} 6 & 9 \\ 12 & 21 \end{bmatrix}$	½	
		$2B=2\begin{bmatrix} 1 & 3 \\ 4 & 6 \end{bmatrix}=\begin{bmatrix} 2 & 6 \\ 8 & 12 \end{bmatrix}$	½	
		$3A-2B=\begin{bmatrix} 6 & 9 \\ 12 & 21 \end{bmatrix}-\begin{bmatrix} 2 & 6 \\ 8 & 12 \end{bmatrix}$		
		$=\begin{bmatrix} 4 & 3 \\ 4 & 9 \end{bmatrix}$	1	**2**
	c)	$AB=\begin{bmatrix} 4 & 2 \\ 8 & 4 \end{bmatrix}\begin{bmatrix} 2 & 6 \\ -4 & -12 \end{bmatrix}$		
		$=\begin{bmatrix} 8-8 & 24-24 \\ 16-16 & 48-48 \end{bmatrix}$	1	
		$=\begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix}$	1	**2**
	d)	$AB=\begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \end{bmatrix}\begin{bmatrix} 1 \\ 9 \\ 8 \end{bmatrix}$		
		$=\begin{bmatrix} 1+18+24 \\ 4+45+48 \end{bmatrix}$	1	
		$=\begin{bmatrix} 43 \\ 97 \end{bmatrix}$	1	**2**

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1)	e)	$\frac{1}{x^2+3x+2}=\frac{1}{(x+1)(x+2)}=\frac{A}{x+1}+\frac{B}{x+2}$	½	
		$\therefore 1=(x+2)A+(x+1)B$		
		$Put\ \ x=-1$		
		$\therefore 1=(-1+2)A+0$		
		$\therefore \boxed{A=1}$	½	
		$Put\ \ x=-2$		
		$\therefore 1=0+(-2+1)B$		
		$\therefore \boxed{B=-1}$	½	
		$\therefore \boxed{\frac{1}{x^2+3x+2}=\frac{1}{x+1}+\frac{-1}{x+2}}$	½	**2**
		Note for partial fraction problems: The problems of partial fractions could also be solved by the method of "equating equal power coefficients". This method is also applicable. Give appropriate marks in accordance with the scheme of marking in the later problems as the solution by this method is not discussed. For the sake of convenience, the solution of the above problem with the help of this method is illustrated hereunder.		
		$\frac{1}{x^2+3x+2}=\frac{1}{(x+1)(x+2)}=\frac{A}{x+1}+\frac{B}{x+2}$	½	
		$\therefore 1=(x+2)A+(x+1)B$		
		$\therefore 0x+1=(A+B)x+(2A+B)$		
		By equating equal power coefficients,		
		$A+B=0 \quad and \quad 2A+B=1$		
		$\therefore \boxed{A=1}$	½	
		$\boxed{B=-1}$	½	
		$\therefore \boxed{\frac{1}{x^2+3x+2}=\frac{1}{x+1}+\frac{-1}{x+2}}$	½	**2**
	f)	$\cos(2A)=\cos(A+A)$		
		$=\cos A\cdot\cos A-\sin A\cdot\sin A$	1	
		$=\cos^2 A-\sin^2 A$	1	**2**

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1)	g)	$\tan(75^\circ)=\tan(30^\circ+45^\circ)$		
		$=\dfrac{\tan(30^\circ)+\tan(45^\circ)}{1-\tan(30^\circ)\tan(45^\circ)}$	½	
		$=\dfrac{\frac{1}{\sqrt{3}}+1}{1-\frac{1}{\sqrt{3}}\cdot 1}$	1	
		$=\dfrac{1+\sqrt{3}}{\sqrt{3}-1}$	½	**2**
		OR		
		$\tan(75^\circ)=\tan(45^\circ+30^\circ)$		
		$=\dfrac{1+\tan(30^\circ)}{1-\tan(30^\circ)}$	½	
		$=\dfrac{1+\frac{1}{\sqrt{3}}}{1-\frac{1}{\sqrt{3}}}$	1	
		$=\dfrac{\sqrt{3}+1}{\sqrt{3}-1}$	½	**2**
	h)	$2\cos 70^\circ \sin 50^\circ=\sin A-\sin B$		
		$\therefore \sin(70^\circ+50^\circ)-\sin(70^\circ-50^\circ)=\sin A-\sin B$		
		$\therefore \sin(120^\circ)-\sin(20^\circ)=\sin A-\sin B$	1	
		$\therefore A=120^\circ$	½	
		$B=20^\circ$	½	**2**
		OR		
		$2\cos 70^\circ \sin 50^\circ=\sin A-\sin B$		
		$\therefore 2\cos 70^\circ \sin 50^\circ=2\cos\left(\dfrac{A+B}{2}\right)\sin\left(\dfrac{A-B}{2}\right)$	½	
		$\therefore \dfrac{A+B}{2}=70 \quad and \quad \dfrac{A-B}{2}=50$	½	
		$\therefore A+B=140$		
		$\underline{A-B=100}$		
		$\therefore A=120$	½	
		$B=20$	½	**2**

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1)	i)	$\sin\left(\theta+\frac{\pi}{6}\right)-\sin\left(\theta-\frac{\pi}{6}\right)=2\cos\left[\frac{\theta+\frac{\pi}{6}+\theta-\frac{\pi}{6}}{2}\right]\cdot\sin\left[\frac{\theta+\frac{\pi}{6}-\theta+\frac{\pi}{6}}{2}\right]$		
		$=2\cos\theta\cdot\sin\left[\frac{\pi}{6}\right]$	1	
		$=2\cos\theta\cdot\frac{1}{2}$	½	
		$=\cos\theta$	½	**2**
		OR		
		$\therefore\sin\left(\theta+\frac{\pi}{6}\right)-\sin\left(\theta-\frac{\pi}{6}\right)$		
		$=\left(\sin\theta\cos\frac{\pi}{6}+\cos\theta\sin\frac{\pi}{6}\right)-\left(\sin\theta\cos\frac{\pi}{6}-\cos\theta\sin\frac{\pi}{6}\right)$	½	
		$=2\cos\theta\sin\frac{\pi}{6}$	½	
		$=2\cos\theta\cdot\frac{1}{2}$	½	
		$=\cos\theta$	½	**2**
		OR		
		$\sin\left(\theta+\frac{\pi}{6}\right)=\sin\theta\cos\frac{\pi}{6}+\cos\theta\sin\frac{\pi}{6}$		
		$=\frac{\sqrt{3}}{2}\sin\theta+\frac{1}{2}\cos\theta$	½	
		$\sin\left(\theta-\frac{\pi}{6}\right)=\frac{\sqrt{3}}{2}\sin\theta-\frac{1}{2}\cos\theta$	½	
		$\therefore\sin\left(\theta+\frac{\pi}{6}\right)-\sin\left(\theta-\frac{\pi}{6}\right)=\cos\theta$	1	**2**
	j)	$Let\ \sin^{-1}(x)=\theta$		
		$\therefore x=\sin\theta$	½	
		$\therefore\frac{1}{x}=\cos ec\theta$	½	
		$\therefore\cos ec^{-1}\left(\frac{1}{x}\right)=\theta$	½	
		$\therefore\cos ec^{-1}\left(\frac{1}{x}\right)=\sin^{-1}(x)$	½	**2**

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1)	k)	Two lines are parallel, if $m_1 = m_2$	1	
		Two lines are perpendicular, if $m_1 = -\dfrac{1}{m_2}$ *or* $m_1 m_2 = -1$ *or* $1 + m_1 m_2 = 0$	1	**2**
	l)	$Range = \text{Largest Value} - \text{Smallest Value}$ $= 50 - 10$ $= 40$	1	
		$Coefficient\ of\ Range = \dfrac{\text{Largest Value} - \text{Smallest Value}}{\text{Largest Value} + \text{Smallest Value}}$ $= \dfrac{50-10}{50+10}$ $= \dfrac{2}{3}$	1	**2**
2)	a)	$D = \begin{vmatrix} 1 & 1 & 0 \\ 0 & 1 & 1 \\ 1 & 0 & 1 \end{vmatrix} = 1(1-0) - 1(0-1) + 0$ $= 2$	1	
		$D_x = \begin{vmatrix} 0 & 1 & 0 \\ 2 & 1 & 1 \\ 4 & 0 & 1 \end{vmatrix} = 0 - 1(2-4) + 0$ $= 2$	½	
		$D_y = \begin{vmatrix} 1 & 0 & 0 \\ 0 & 2 & 1 \\ 1 & 4 & 1 \end{vmatrix} = 1(2-4) - 0 + 0$ $= -2$	½	
		$D_z = \begin{vmatrix} 1 & 1 & 0 \\ 0 & 1 & 2 \\ 1 & 0 & 4 \end{vmatrix} = 1(4-0) - 1(0-2) + 0$ $= 6$	½	
		$\therefore x = \dfrac{D_x}{D} = \dfrac{2}{2} = 1$	½	
		$y = \dfrac{D_y}{D} = \dfrac{-2}{2} = -1$	½	
		$z = \dfrac{D_z}{D} = \dfrac{6}{2} = 3$	½	**4**

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2)	b)	$\left\{3\begin{bmatrix}3 & 1\\4 & 0\\3 & -3\end{bmatrix}-2\begin{bmatrix}0 & 2\\-2 & 3\\-5 & 4\end{bmatrix}\right\}\begin{bmatrix}-1\\2\end{bmatrix}=\begin{bmatrix}x\\y\\z\end{bmatrix}$		
		$\therefore\left\{\begin{bmatrix}9 & 3\\12 & 0\\9 & -9\end{bmatrix}-\begin{bmatrix}0 & 4\\-4 & 6\\-10 & 8\end{bmatrix}\right\}\begin{bmatrix}-1\\2\end{bmatrix}=\begin{bmatrix}x\\y\\z\end{bmatrix}$ *or* $\begin{bmatrix}9-0 & 3-4\\12+4 & 0-6\\9+10 & -9-8\end{bmatrix}\begin{bmatrix}-1\\2\end{bmatrix}=\begin{bmatrix}x\\y\\z\end{bmatrix}$	1	
		$\therefore\begin{bmatrix}9 & -1\\16 & -6\\19 & -17\end{bmatrix}\begin{bmatrix}-1\\2\end{bmatrix}=\begin{bmatrix}x\\y\\z\end{bmatrix}$	1	
		$\therefore\begin{bmatrix}-9-2\\-16-12\\-19-34\end{bmatrix}=\begin{bmatrix}x\\y\\z\end{bmatrix}$		
		$\therefore\begin{bmatrix}-11\\-28\\-53\end{bmatrix}=\begin{bmatrix}x\\y\\z\end{bmatrix}$	1	
		$\therefore x=-11,\quad y=-28,\quad z=-53$	1	**4**
	c)	$(AB)C=\left(\begin{bmatrix}2 & -2\\3 & 1\end{bmatrix}\begin{bmatrix}-1 & 5\\4 & -3\end{bmatrix}\right)\begin{bmatrix}7 & -5\\0 & 5\end{bmatrix}$		
		$=\begin{bmatrix}-10 & 16\\1 & 12\end{bmatrix}\begin{bmatrix}7 & -5\\0 & 5\end{bmatrix}$	1	
		$=\begin{bmatrix}-70 & 130\\7 & 55\end{bmatrix}$	1	
		$A(BC)=\begin{bmatrix}2 & -2\\3 & 1\end{bmatrix}\left(\begin{bmatrix}-1 & 5\\4 & -3\end{bmatrix}\begin{bmatrix}7 & -5\\0 & 5\end{bmatrix}\right)$		
		$=\begin{bmatrix}2 & -2\\3 & 1\end{bmatrix}\begin{bmatrix}-7 & 30\\28 & -35\end{bmatrix}$	1	
		$=\begin{bmatrix}-70 & 130\\7 & 55\end{bmatrix}$	½	
		$\therefore\boxed{(AB)C=A(BC)}$	½	
		OR		
		$AB=\begin{bmatrix}2 & -2\\3 & 1\end{bmatrix}\begin{bmatrix}-1 & 5\\4 & -3\end{bmatrix}$		
		$=\begin{bmatrix}-10 & 16\\1 & 12\end{bmatrix}$	1	

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2)		$\left(AB\right)C=\begin{bmatrix}-10 & 16\\ 1 & 12\end{bmatrix}\begin{bmatrix}7 & -5\\ 0 & 5\end{bmatrix}$		
		$=\begin{bmatrix}-70 & 130\\ 7 & 55\end{bmatrix}$	1	
		$BC=\begin{bmatrix}-1 & 5\\ 4 & -3\end{bmatrix}\begin{bmatrix}7 & -5\\ 0 & 5\end{bmatrix}$		
		$=\begin{bmatrix}-7 & 30\\ 28 & -35\end{bmatrix}$	1	
		$A\left(BC\right)=\begin{bmatrix}2 & -2\\ 3 & 1\end{bmatrix}\begin{bmatrix}-7 & 30\\ 28 & -35\end{bmatrix}$		
		$=\begin{bmatrix}-70 & 130\\ 7 & 55\end{bmatrix}$	½	
		$\therefore \boxed{\left(AB\right)C=A\left(BC\right)}$	½	**4**
	d)	$AB=\begin{bmatrix}1 & -3\\ 2 & -1\end{bmatrix}\begin{bmatrix}1 & 0 & 1\\ 2 & -1 & 3\end{bmatrix}$		
		$=\begin{bmatrix}-5 & 3 & -8\\ 0 & 1 & -1\end{bmatrix}$	1	
		$\left(AB\right)^T=\begin{bmatrix}-5 & 0\\ 3 & 1\\ -8 & -1\end{bmatrix}$	1	
		$B^T A^T=\begin{bmatrix}1 & 2\\ 0 & -1\\ 1 & 3\end{bmatrix}\begin{bmatrix}1 & 2\\ -3 & -1\end{bmatrix}$	1	
		$=\begin{bmatrix}-5 & 0\\ 3 & 1\\ -8 & -1\end{bmatrix}$	1	**4**
		OR		
		$\left(AB\right)^T=\left\{\begin{bmatrix}1 & -3\\ 2 & -1\end{bmatrix}\begin{bmatrix}1 & 0 & 1\\ 2 & -1 & 3\end{bmatrix}\right\}^T$		
		$=\left\{\begin{bmatrix}-5 & 3 & -8\\ 0 & 1 & -1\end{bmatrix}\right\}^T$	1	
		$=\begin{bmatrix}-5 & 0\\ 3 & 1\\ -8 & -1\end{bmatrix}$	1	

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2)		$B^T A^T = \begin{bmatrix} 1 & 2 \\ 0 & -1 \\ 1 & 3 \end{bmatrix}\begin{bmatrix} 1 & 2 \\ -3 & -1 \end{bmatrix}$	1	
		$= \begin{bmatrix} -5 & 0 \\ 3 & 1 \\ -8 & -1 \end{bmatrix}$	1	**4**
	e)	$\frac{x^2+1}{x\left(x^2-1\right)} = \frac{x^2+1}{x(x+1)(x-1)} = \frac{A}{x}+\frac{B}{x+1}+\frac{C}{x-1}$	½	
		$\therefore x^2+1=(x+1)(x-1)A+x(x-1)B+x(x+1)C$ $Put\ \ x=0$ $\therefore 0+1=(0+1)(0-1)A+0+0$ $\therefore 1=-A$ $\therefore \boxed{A=-1}$	1	
		$Put\ \ x=-1$ $\therefore (-1)^2+1=0-1(-1-1)B+0$ $\therefore 2=2B$ $\therefore \boxed{B=1}$	1	
		$Put\ \ x=1$ $\therefore (1)^2+1=0+0+1(1+1)C$ $\therefore 2=2C$ $\therefore \boxed{C=1}$	1	
		$\therefore \boxed{\frac{x^2+1}{x\left(x^2-1\right)}=\frac{-1}{x}+\frac{1}{x+1}+\frac{1}{x-1}}$	½	**4**
		Note: If the problem is solved as illustrated below, the solution is consider to be incomplete and marks may be given accordingly. $\frac{x^2+1}{x\left(x^2-1\right)}=\frac{A}{x}+\frac{Bx+C}{x^2-1}$ $Consequently,\ we\ get$ $\therefore \boxed{A=-1}$	1	
		$\boxed{B=2}\ \ and\ \ \boxed{C=0}$ $\therefore \boxed{\frac{x^2+1}{x\left(x^2-1\right)}=\frac{-1}{x}+\frac{2x}{x^2-1}}$	1	

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2)	f)	$\frac{1}{(x+1)^2(x+2)}=\frac{A}{x+1}+\frac{B}{(x+1)^2}+\frac{C}{(x+2)}$	½	
		$\therefore 1=(x+1)(x+2)A+(x+2)B+(x+1)^2C$		
		$Put\ \ x=-1$		
		$\therefore 1=0+(-1+2)B+0$		
		$\therefore \boxed{B=1}$	1	
		$Put\ \ x=-2$		
		$\therefore 1=0+0+(-2+1)^2C$		
		$\therefore \boxed{C=1}$	1	
		$Put\ \ x=0$		
		$\therefore 1=(1)(2)A+(2)B+(1)^2C$		
		$\therefore 1=2A+2B+C$	1	
		$\therefore \boxed{A=-1}$		
		$\therefore \boxed{\frac{1}{(x+1)^2(x+2)}=\frac{-1}{x+1}+\frac{1}{(x+1)^2}+\frac{1}{(x+2)}}$	½	**4**
3)	a)	$x+y+z=3$		
		$3x-2y+3z=4$		
		$5x+5y+z=11$		
		$\therefore A=\begin{bmatrix}1&1&1\\3&-2&3\\5&5&1\end{bmatrix},\quad X=\begin{bmatrix}x\\y\\z\end{bmatrix},\quad B=\begin{bmatrix}3\\4\\11\end{bmatrix}$		
		$\therefore \lvert A\rvert=\begin{vmatrix}1&1&1\\3&-2&3\\5&5&1\end{vmatrix}=1(-2-15)-1(3-15)+1(15+10)$		
		$=20$	½	
		$\therefore adj(A)=\begin{bmatrix}-17&4&5\\12&-4&0\\25&0&-5\end{bmatrix}$ ----------(*)	1	
		$\therefore A^{-1}=\frac{1}{\lvert A\rvert}adj(A)$		
		$=\frac{1}{20}\begin{bmatrix}-17&4&5\\12&-4&0\\25&0&-5\end{bmatrix}$	1	

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3)		$\therefore$ the solution is, $X = A^{-1}B$ $= \frac{1}{20}\begin{bmatrix} -17 & 4 & 5 \\ 12 & -4 & 0 \\ 25 & 0 & -5 \end{bmatrix}\begin{bmatrix} 3 \\ 4 \\ 11 \end{bmatrix}$ $= \frac{1}{20}\begin{bmatrix} 20 \\ 20 \\ 20 \end{bmatrix}$ $= \begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix}$	1	
		$\therefore x = 1, \quad y = 1, \quad z = 1$	½	**4**
		(*) Note: Many methods are followed to find $adj(A)$ such as first to find Matrix of Minors and then to find Cofactor matrix. Many times students first find all the minors independently and then the Matrix of Minors is formed. Also directly Cofactor Matrix can be found for $adj(A)$. All these methods are applicable. Further note that if only few items in $adj(A)$ are incorrect, you may deduct mark accordingly. For sake of convenience, one method of finding $adj(A)$ using Cofactor Matrix is illustrated below.		
		$C(A) = \begin{bmatrix} \begin{vmatrix} -2 & 3 \\ 5 & 1 \end{vmatrix} & -\begin{vmatrix} 3 & 3 \\ 5 & 1 \end{vmatrix} & \begin{vmatrix} 3 & -2 \\ 5 & 5 \end{vmatrix} \\ -\begin{vmatrix} 1 & 1 \\ 5 & 1 \end{vmatrix} & \begin{vmatrix} 1 & 1 \\ 5 & 1 \end{vmatrix} & -\begin{vmatrix} 1 & 1 \\ 5 & 5 \end{vmatrix} \\ \begin{vmatrix} 1 & 1 \\ -2 & 3 \end{vmatrix} & -\begin{vmatrix} 1 & 1 \\ 3 & 3 \end{vmatrix} & \begin{vmatrix} 1 & 1 \\ 3 & -2 \end{vmatrix} \end{bmatrix}$ $= \begin{bmatrix} -17 & 12 & 25 \\ 4 & -4 & 0 \\ 5 & 0 & -5 \end{bmatrix}$ $\therefore adj(A) = C(A)^T = \begin{bmatrix} -17 & 4 & 5 \\ 12 & -4 & 0 \\ 25 & 0 & -5 \end{bmatrix}$		

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3)	b)	$\frac{x}{x^3-1}=\frac{x}{(x-1)(x^2+x+1)}$	½	
		$=\frac{A}{x-1}+\frac{Bx+C}{x^2+x+1}$		
		$\therefore x=(x^2+x+1)A+(x-1)(Bx+C)$		
		$Put\ x=1$		
		$\therefore 1=((-1)^2+1+1)A+0$		
		$\therefore 1=3A$		
		$\therefore \boxed{A=\frac{1}{3}}$	1	
		$Put\ x=0$		
		$\therefore 0=(0^2+0+1)A+(0-1)(0+C)$		
		$\therefore 0=A-C$		
		$\therefore 0=\frac{1}{3}-C$		
		$\therefore \boxed{C=\frac{1}{3}}$	1	
		$Put\ x=-1$		
		$\therefore -1=(1^2-1+1)A+(-1-1)(-B+C)$		
		$\therefore -1=A+2B-2C$		
		$\therefore -1=\frac{1}{3}+2B-\frac{2}{3}$		
		$\therefore \boxed{B=-\frac{1}{3}}$	1	
		$\therefore \boxed{\frac{x}{x^3-1}=\frac{\frac{1}{3}}{x-1}+\frac{-\frac{1}{3}x+\frac{1}{3}}{x^2+x+1}}$	½	**4**
	c)	$Put\ \sin\theta=x$		
		$\frac{\sin\theta+1}{(\sin\theta+2)(\sin\theta+3)}=\frac{x+1}{(x+2)(x+3)}=\frac{A}{x+2}+\frac{B}{x+3}$	1	
		$\therefore x+1=(x+3)A+(x+2)B$		
		$Put\ x=-2$		
		$\therefore -2+1=(-2+3)A+0$		
		$\therefore \boxed{A=-1}$	1	

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3)		$Put\ x=-3$ $\therefore -3+1=0+(-3+2)B$ $\therefore \boxed{B=2}$	1	
		$\therefore \dfrac{x+1}{(x+2)(x+3)}=\dfrac{-1}{x+2}+\dfrac{2}{x+3}$ $\therefore \boxed{\dfrac{\sin\theta+1}{(\sin\theta+2)(\sin\theta+3)}=\dfrac{-1}{\sin\theta+2}+\dfrac{2}{\sin\theta+3}}$	1	**4**
	d)	$\cos(\pi+\theta)=\cos\pi\cos\theta-\sin\pi\sin\theta$	1	
		$=(-1)\cos\theta-0\cdot\sin\theta$	1+1	
		$=-\cos\theta$	1	**4**
	e)	$\dfrac{\sin A-\sin 3A}{\sin^2 A-\cos^2 A}=\dfrac{2\cos 2A\sin(-A)}{\sin^2 A-\cos^2 A}$	1	
		$=\dfrac{-2\cos 2A\sin A}{-(\cos^2 A-\sin^2 A)}$	1	
		$=\dfrac{-2\cos 2A\sin A}{-\cos 2A}$	1	
		$=2\sin A$	1	**4**
		OR		
		$\dfrac{\sin A-\sin 3A}{\sin^2 A-\cos^2 A}=\dfrac{2\cos 2A\sin(-A)}{\sin^2 A-\cos^2 A}$	1	
		$=\dfrac{-2\cos 2A\sin A}{\sin^2 A-\cos^2 A}$	1	
		$=\dfrac{-2(\cos^2 A-\sin^2 A)\sin A}{-(\cos^2 A-\sin^2 A)}$	1	
		$=2\sin A$	1	**4**
		OR		
		$\dfrac{\sin A-\sin 3A}{\sin^2 A-\cos^2 A}=\dfrac{\sin A-(3\sin A-4\sin^3 A)}{\sin^2 A-\cos^2 A}$	1	
		$=\dfrac{-2\sin A+4\sin^3 A}{\sin^2 A-\cos^2 A}$		
		$=\dfrac{-2\sin A(1-2\sin^2 A)}{-(\cos^2 A-\sin^2 A)}$	1	
		$=\dfrac{-2\sin A(\cos 2A)}{-(\cos 2A)}$	1	
		$=2\sin A$	1	**4**

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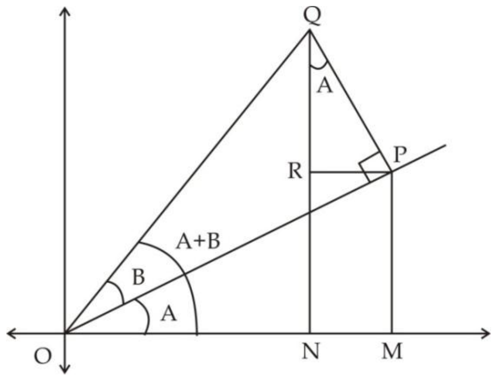
3)	f)	$\tan^{-1}\left(\frac{1}{7}\right)+\tan^{-1}\left(\frac{1}{13}\right)=\tan^{-1}\left(\frac{\frac{1}{7}+\frac{1}{13}}{1-\frac{1}{7}\cdot\frac{1}{13}}\right)$	2	
		$=\tan^{-1}\left(\frac{20}{90}\right)$	1	
		$=\tan^{-1}\left(\frac{2}{9}\right)$	1	**4**
	g)		1	

Right Angled Triangle	Acute Angle	Trigonometric Ratios
Δ OMP	∠MOP = A	$\sin A=\frac{PM}{OP}$, $\cos A=\frac{OM}{OP}$
Δ OPQ	∠POQ = B	$\sin B=\frac{PQ}{OQ}$, $\cos B=\frac{OP}{OQ}$
Δ PRQ	∠PQR = A	$\sin A=\frac{PR}{PQ}$, $\cos A=\frac{QR}{PQ}$
Δ ONQ	∠NOQ = A+B	$\sin(A+B)=\frac{QN}{OQ}$, $\cos(A+B)=\frac{ON}{OQ}$

$$\sin(A+B)=\frac{QN}{OQ}$$

$$=\frac{QR+RN}{OQ}$$ 1

$$=\frac{QR+PM}{OQ}$$

$$=\frac{QR}{OQ}+\frac{PM}{OQ}$$

$$=\frac{QR}{PQ}\times\frac{PQ}{OQ}+\frac{PM}{OP}\times\frac{OP}{OQ}$$ 1

$$=\cos A.\sin B+\sin A.\cos B$$ 1 **4**

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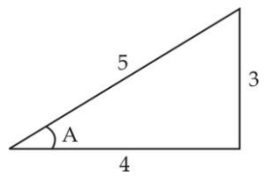
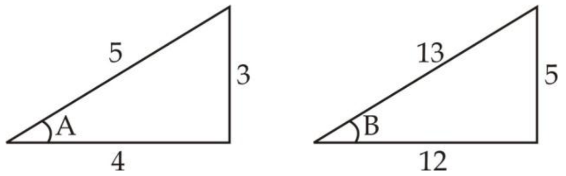
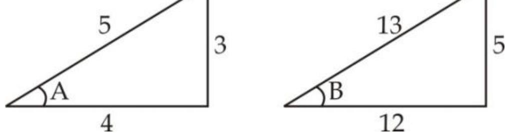
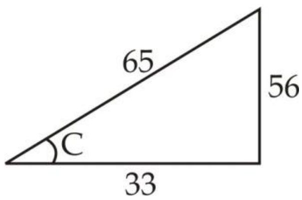
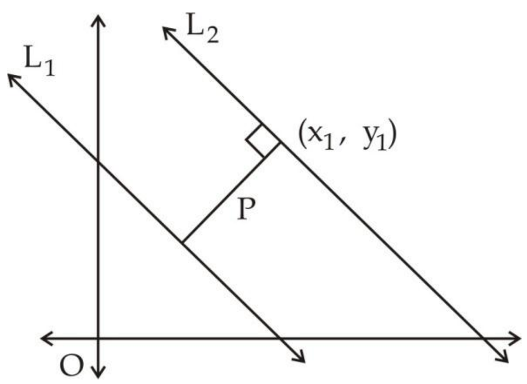
3)		**Note:** The above is proved by different ways in several books. Consider all these proof but check whether the method is falling within the scope of curriculum and give appropriate marks in accordance with the scheme of marking. In accordance with the Teacher's Manual published by MSBTE, the result is treated as Fundamental Result which is not proved by the help of any another result. If the above result is proved by students using any another result, suppose using cos (A+B), then this result i.e., cos (A+B) must have been proved first.		
4)	a)	$\cos(510^\circ)=\cos(6\times 90^\circ-30^\circ)$ $=-\cos 30^\circ$ $=-\frac{\sqrt{3}}{2} \quad or \quad -0.866$	 ½	
		$\cos(330^\circ)=\cos(4\times 90^\circ-30^\circ)$ $=\cos 30^\circ$ $=\frac{\sqrt{3}}{2}$	 ½	
		$\sin(390^\circ)=\sin(4\times 90^\circ+30^\circ)$ $=\sin 30^\circ$ $=\frac{1}{2}$	 ½	
		$\cos(120^\circ)=\cos(90^\circ+30^\circ)$ $=-\sin 30^\circ$ $=-\frac{1}{2}$	 ½	
		$\cos(510^\circ)\cos(330^\circ)+\sin(390^\circ)\cos(120^\circ)$ $=\left(-\frac{\sqrt{3}}{2}\right)\left(\frac{\sqrt{3}}{2}\right)+\left(\frac{1}{2}\right)\left(-\frac{1}{2}\right)$ $=-1$	 1 1	 **4**
		Note: The above example may be proved in different ways by expressing the ratio in many ways e.g., instead of expressing $\cos(510^\circ)=\cos(6\times 90^\circ-30^\circ)$, one can express it as $\cos(510^\circ)=\cos(5\times 90^\circ+60^\circ)$ and the get the desired value. Further here in this example it is expected that it must be proved without using calculator. If directly calculator is used, no marks to be given. **Also the value of** $\cos(510^\circ)$ **written in decimal points is also considerable.**		

Que. No.	Sub. Que.	Model answers	Marks	Total Marks
4)	c)	*We know that,*		
		$\cos(A+B)+\cos(A-B)=2\cos A\cos B$	1	
		Put $A+B=C$		
		$A-B=D$		
		$\therefore A=\dfrac{C+D}{2}$ *and*	1	
		$B=\dfrac{C-D}{2}$	1	
		$\therefore \cos C+\cos D=2\cos\left(\dfrac{C+D}{2}\right)\cos\left(\dfrac{C-D}{2}\right)$	1	**4**
	d)	$\sin A\sin(60-A)\sin(60+A)=\sin A\left(\sin^2 60-\sin^2 A\right)$	1	
		$=\sin A\left(\dfrac{3}{4}-\sin^2 A\right)$	1	
		$=\dfrac{1}{4}\sin A\left[3-4\sin^2 A\right]$		
		$=\dfrac{1}{4}\left[3\sin A-4\sin^3 A\right]$	1	
		$=\dfrac{1}{4}\sin 3A$	1	**4**
		OR		
		$\sin A\sin(60-A)\sin(60+A)=\sin A\cdot\dfrac{1}{-2}(\cos 120-\cos 2A)$	1	
		$=-\dfrac{1}{2}\sin A\cdot\left[\cos(90+30)-\cos 2A\right]$		
		$=-\dfrac{1}{2}\sin A\cdot[-\sin 30-\cos 2A]$	½	
		$=\dfrac{1}{2}\sin A\cdot\left[\dfrac{1}{2}+1-2\sin^2 A\right]$	½	
		$=\dfrac{1}{2}\sin A\cdot\left(\dfrac{3}{2}-2\sin^2 A\right)$		
		$=\dfrac{1}{4}\sin A\left[3-4\sin^2 A\right]$		
		$=\dfrac{1}{4}\left[3\sin A-4\sin^3 A\right]$	1	
		$=\dfrac{1}{4}\sin 3A$	1	**4**
		OR		

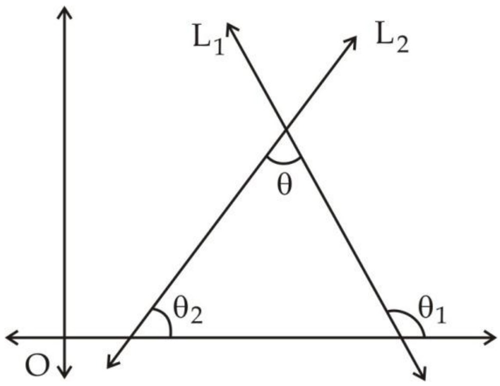
Que. No.	Sub. Que.	Model answers	Marks	Total Marks
4)		$\sin A\sin\left(60-A\right)\sin\left(60+A\right)$		
		$=\sin A\left(\sin 60\cos A-\cos 60\sin A\right)\left(\sin 60\cos A+\cos 60\sin A\right)$	1	
		$=\sin A\left(\sin^2 60\cos^2 A-\cos^2 60\sin^2 A\right)$		
		$=\sin A\left(\frac{3}{4}\cos^2 A-\frac{1}{4}\sin^2 A\right)$	1	
		$=\frac{1}{4}\sin A\left(3\cos^2 A-\sin^2 A\right)$		
		$=\frac{1}{4}\sin A\left[3\left(1-\sin^2 A\right)-\sin^2 A\right]$		
		$=\frac{1}{4}\sin A\left[3-4\sin^2 A\right]$	1	
		$=\frac{1}{4}\left[3\sin A-4\sin^3 A\right]$		
		$=\frac{1}{4}\sin 3A$	1	**4**
	e)	$A=\cos^{-1}\left(\frac{4}{5}\right)$		
		$\therefore \cos A=\frac{4}{5}$		
				
		$\therefore \tan A=\frac{3}{4}$		
		$\therefore A=\tan^{-1}\left(\frac{3}{4}\right)$	1	
		$\therefore \cos^{-1}\left(\frac{4}{5}\right)+\tan^{-1}\left(\frac{3}{5}\right)=\tan^{-1}\left(\frac{3}{4}\right)+\tan^{-1}\left(\frac{3}{5}\right)$		
		$=\tan^{-1}\left(\frac{\frac{3}{4}+\frac{3}{5}}{1-\frac{3}{4}\cdot\frac{3}{5}}\right)$	1	
		$=\tan^{-1}\left(\frac{\frac{15+12}{20}}{\frac{20-9}{20}}\right)$	1	
		$=\tan^{-1}\left(\frac{27}{11}\right)$	1	**4**

Que. No.	Sub. Que.	Model answers	Marks	Total Marks
4)	f)	$A=\sin^{-1}\left(\frac{3}{5}\right) \qquad B=\cos^{-1}\left(\frac{12}{13}\right)$		
		$\therefore \sin A=\frac{3}{5} \qquad \cos B=\frac{12}{13}$		
				
		$\sin\left(A+B\right)=\sin A\cos B+\cos A\sin B$	1	
		$=\frac{3}{5}\times\frac{12}{13}+\frac{4}{5}\times\frac{5}{13}$	1	
		$=\frac{36}{65}+\frac{20}{65}$		
		$=\frac{36+20}{65}$		
		$=\frac{56}{65}$	1	
		$\therefore A+B=\sin^{-1}\left(\frac{56}{65}\right)$		
		$\therefore \sin^{-1}\left(\frac{3}{5}\right)+\cos^{-1}\left(\frac{12}{13}\right)=\sin^{-1}\left(\frac{56}{65}\right)$	1	**4**
		OR		
		$A=\sin^{-1}\left(\frac{3}{5}\right) \qquad B=\cos^{-1}\left(\frac{12}{13}\right)$		
		$\therefore \sin A=\frac{3}{5} \qquad \cos B=\frac{12}{13}$		
				
		$\tan A=\frac{3}{4} \qquad \tan B=\frac{5}{12}$		
		$\therefore A=\tan^{-1}\left(\frac{3}{4}\right) \qquad B=\tan^{-1}\left(\frac{5}{12}\right)$		
		$\therefore \sin^{-1}\left(\frac{3}{5}\right)=\tan^{-1}\left(\frac{3}{4}\right) \qquad \cos^{-1}\left(\frac{12}{13}\right)=\tan^{-1}\left(\frac{5}{12}\right)$	1	

Que. No.	Sub. Que.	Model answers	Marks	Total Marks
5)		$\therefore \sin^{-1}\left(\frac{3}{5}\right)+\cos^{-1}\left(\frac{12}{13}\right)=\tan^{-1}\left(\frac{3}{4}\right)+\tan^{-1}\left(\frac{5}{12}\right)$		
		$=\tan^{-1}\left(\frac{\frac{3}{4}+\frac{5}{12}}{1-\frac{3}{4}\cdot\frac{5}{12}}\right)$		
		$=\tan^{-1}\left(\frac{\frac{9+5}{12}}{\frac{16-5}{16}}\right)$		
		$=\tan^{-1}\left(\frac{56}{33}\right)$	1	
		$Let\ \tan^{-1}\left(\frac{56}{33}\right)=C$		
		$\therefore \tan C=\frac{56}{33}$		
				
		$\therefore \sin C=\frac{56}{65}$		
		$\therefore C=\sin^{-1}\left(\frac{56}{65}\right)$		
		$\therefore \tan^{-1}\left(\frac{56}{33}\right)=\sin^{-1}\left(\frac{56}{65}\right)$	1	
		$\therefore \sin^{-1}\left(\frac{3}{5}\right)+\cos^{-1}\left(\frac{12}{13}\right)=\sin^{-1}\left(\frac{56}{65}\right)$	1	**4**
5)	a)	$\frac{\sin 4\theta+\sin 2\theta}{1+\cos 2\theta+\cos 4\theta}=\frac{\sin 2(2\theta)+\sin 2\theta}{1+\cos 2(2\theta)+\cos 2\theta}$		
		$=\frac{2\sin 2\theta\cos 2\theta+\sin 2\theta}{2\cos^2 2\theta+\cos 2\theta}$	1	
		$=\frac{\sin 2\theta(2\cos 2\theta+1)}{\cos 2\theta(2\cos 2\theta+1)}$	1	
		$=\frac{\sin 2\theta}{\cos 2\theta}$	1	
		$=\tan 2\theta$	1	**4**

Que. No.	Sub. Que.	Model answers	Marks	Total Marks
5)	b)	$\dfrac{\sin A+\sin 2A+\sin 3A+\sin 4A}{\cos A+\cos 2A+\cos 3A+\cos 4A}$		
		$=\dfrac{(\sin A+\sin 4A)+(\sin 2A+\sin 3A)}{(\cos A+\cos 4A)+(\cos 2A+\cos 3A)}$		
		$=\dfrac{2\sin\left(\frac{5A}{2}\right)\cos\left(\frac{-3A}{2}\right)+2\sin\left(\frac{5A}{2}\right)\cos\left(\frac{-A}{2}\right)}{2\cos\left(\frac{5A}{2}\right)\cos\left(\frac{-3A}{2}\right)+2\cos\left(\frac{5A}{2}\right)\cos\left(\frac{-A}{2}\right)}$	1+1	
		$=\dfrac{2\sin\left(\frac{5A}{2}\right)\left[\cos\left(\frac{-3A}{2}\right)+\cos\left(\frac{-A}{2}\right)\right]}{2\cos\left(\frac{5A}{2}\right)\left[\cos\left(\frac{-3A}{2}\right)+\cos\left(\frac{-A}{2}\right)\right]}$		
		$=\dfrac{\sin\left(\frac{5A}{2}\right)}{\cos\left(\frac{5A}{2}\right)}$	1	
		$=\tan\left(\frac{5A}{2}\right)$	1	**4**
	c)	$2\tan^{-1}x=\tan^{-1}x+\tan^{-1}x$	1	
		$=\tan^{-1}\left(\dfrac{x+x}{1-x.x}\right)$	2	
		$=\tan^{-1}\left(\dfrac{2x}{1-x^2}\right)$	1	**4**
	d)		1	
		$Let\ L_1\equiv ax+by+c_1=0$		
		$L_2\equiv ax+by+c_2=0$		
		$(x_1,\ y_1)$ *be a point on the line* L_2.		
		$\therefore ax_1+by_1+c_2=0$	1	

Que. No.	Sub. Que.	Model answers	Marks	Total Marks
5)		*Now the perpendicular distance from* $(x_1,\ y_1)$ *on* L_1 *is,*		
		$P=\left\|\dfrac{ax_1+by_1+c_1}{\sqrt{a^2+b^2}}\right\|$	1	
		$=\left\|\dfrac{-c_2+c_1}{\sqrt{a^2+b^2}}\right\|$	1	
		$OR \quad \left\|\dfrac{c_1-c_2}{\sqrt{a^2+b^2}}\right\|$		**4**
	e)	$2x+3y=13$ $\underline{5x-y=7}$ $\therefore\ 2x+3y=13$ $\underline{15x-3y=21}$ $\therefore\ 17x=34$		
		$\therefore x=2$	½	
		$y=3$	½	
		$\therefore$ Point of intersection $=(2,\ 3)$ Slope of the line $3x-y+7=0$ is,		
		$m_0=-\dfrac{a}{b}=-\dfrac{3}{-1}=3$	1	
		$\therefore$ Slope of the required line is, $m=-\dfrac{1}{m_0}=-\dfrac{1}{3}$	1	
		$\therefore$ *equation is,* $y-y_1=m(x-x_1)$ $\therefore\ y-3=-\dfrac{1}{3}(x-2)$		
		$\therefore x+3y-11=0$	1	**4**
	f)	*For* $2x+3y+5=0,$		
		slope $m_1=-\dfrac{a}{b}=-\dfrac{2}{3}$	½	
		For $x-2y-4=0,$		
		slope $m_1=-\dfrac{a}{b}=-\dfrac{1}{-2}=\dfrac{1}{2}$	½	

Que. No.	Sub. Que.	Model answers	Marks	Total Marks
5)		$\therefore \tan\theta = \left\lvert \dfrac{m_1 - m_2}{1 + m_1 \cdot m_2} \right\rvert$		
		$= \left\lvert \dfrac{-\frac{2}{3} - \frac{1}{2}}{1 + \left(-\frac{2}{3}\right)\cdot\left(\frac{1}{2}\right)} \right\rvert$	1	
		$= \dfrac{7}{4} \quad or \quad 1.75$	1	
		$\therefore \theta = \tan^{-1}\left(\dfrac{7}{4}\right) \quad or \quad \tan^{-1}(1.75)$	1	4
6)	a)		1	
		Let θ_1 = Angle of inclination of L_1 θ_2 = Angle of inclination of L_2 $\therefore$ Slope of L_1 is $m_1 = \tan\theta_1$ Slope of L_2 is $m_2 = \tan\theta_2$		
		$\therefore$ *from figure,* $\theta = \theta_1 - \theta_2$	½	
		$\therefore \tan\theta = \tan(\theta_1 - \theta_2)$ $= \dfrac{\tan(\theta_1) - \tan(\theta_2)}{1 + \tan(\theta_1)\tan(\theta_2)}$	1	
		$= \dfrac{m_1 - m_2}{1 + m_1 \cdot m_2}$	½	
		$\therefore \theta = \tan^{-1} \dfrac{m_1 - m_2}{1 + m_1 \cdot m_2}$	½	
		For angle to be acute, $\theta = \tan^{-1}\left\lvert \dfrac{m_1 - m_2}{1 + m_1 \cdot m_2} \right\rvert$	½	4

Que. No.	Sub. Que.	Model answers	Marks	Total Marks
6)	b)	$x+y=0$		
		$\underline{2x-y=9}$		
		$\therefore\ 3x=9$		
		$\therefore x=3$	½	
		$y=-3$	½	
		$\therefore$ Point of intersection $=(3,-3)$	1	
		$\therefore$ *equation is,*		
		$\dfrac{y-y_1}{y_2-y_1}=\dfrac{x-x_1}{x_2-x_1}$		
		$\therefore \dfrac{y-5}{-3-5}=\dfrac{x-2}{3-2}$	1	
		$\therefore 8x+y-21=0$	1	**4**
		OR		
		$\therefore$ Point of intersection $=(3,-3)$	1	
		$\therefore Slope\ m=\dfrac{y_2-y_1}{x_2-x_1}=\dfrac{-3-5}{3-2}=-8$	1	
		$\therefore$ *equation is,*		
		$y-y_1=m(x-x_1)$		
		$\therefore y-5=-8(x-2)$		
		$\therefore 8x+y-21=0$	1	**4**
	c)	(table below)	1+1	
		$\bar{x}=\dfrac{\sum f_i x_i}{N}=\dfrac{1350}{50}=27$	1	
		$M.D.=\dfrac{\sum f_i D_i}{N}=\dfrac{472}{50}=9.44$	1	**4**

Class	xi	f_i	$f_i x_i$	$D_i=\lvert x_i-\bar{x}\rvert$	$f_i D_i$
0-10	5	5	25	22	110
10-20	15	8	120	12	96
20-30	25	15	375	2	30
30-40	35	16	560	8	128
40-50	45	6	270	18	108
		50	**1350**		**472**

Que. No.	Sub. Que.	Model answers	Marks	Total Marks
6)	d)			

Class	xi	f_i	$f_i x_i$	x_i^2	$f_i x_i^2$
0-5	2.5	3	7.5	6.25	18.75
5-10	7.5	5	37.5	56.25	281.25
10-15	12.5	9	112.5	156.25	1406.25
15-20	17.5	15	262.5	306.25	4593.75
20-25	22.5	20	450	506.25	10125
25-30	27.5	16	440	756.25	12100
30-35	32.5	10	325	1056.25	10562.5
35-40	37.5	2	75	1406.25	2812.5
		80	**1710**		**41900**

1+1

$$S.D. = \sqrt{\frac{\sum f_i x_i^2}{N} - \left(\frac{\sum f_i x_i}{N}\right)^2}$$

$$= \sqrt{\frac{41900}{80} - \left(\frac{1710}{80}\right)^2}$$ 1

$$= 8.177$$ 1 **4**

OR

Class	xi	f_i	d_i	$f_i d_i$	d_i^2	$f_i d_i^2$
0-5	2.5	3	-3	-9	9	27
5-10	7.5	5	-2	-10	4	20
10-15	12.5	9	-1	-9	1	9
15-20	**17.5**	**15**	**0**	**0**	**0**	**0**
20-25	22.5	20	1	20	1	20
25-30	27.5	16	2	32	4	64
30-35	32.5	10	3	30	9	90
35-40	37.5	2	4	8	16	32
		80		**62**		**262**

1+1

$$A = 17.5 \quad h = 5, \quad d_i = \frac{x_i - A}{h}$$

$$S.D. = h \times \sqrt{\frac{\sum f_i d_i^2}{N} - \left(\frac{\sum f_i d_i}{N}\right)^2}$$

$$= 5 \times \sqrt{\frac{262}{80} - \left(\frac{62}{80}\right)^2}$$ 1

$$= 8.177$$ 1 **4**

Note: Students may take any another value for A in the above/ below example. So the above table and corresponding values vary accordingly. But the final answer will be the same.

Que. No.	Sub. Que.	Model answers	Marks	Total Marks
6)	e)			

Class	xi	f_i	$f_i x_i$	x_i^2	$f_i x_i^2$
0-10	5	14	70	25	350
10-20	15	23	345	225	5175
20-30	25	27	675	625	16875
30-40	35	21	735	1225	25725
40-50	45	15	675	2025	30375
			2500		**78500**

1

$$\bar{x} = \frac{\sum f_i x_i}{N} = \frac{2500}{100} = 25$$

1

$$S.D. = \sqrt{\frac{\sum f_i x_i^2}{N} - \left(\frac{\sum f_i x_i}{N}\right)^2}$$

$$= \sqrt{\frac{78500}{100} - \left(\frac{2500}{100}\right)^2}$$

$$= 12.649$$

½

$$\therefore Variance = (S.D.)^2$$

$$= 12.649^2$$

$$= 159.997$$

½

$$Coeff.\ of\ Variance = \frac{S.D.}{\bar{x}} \times 100$$

$$= \frac{12.649}{25} \times 100$$

$$= 50.596$$

1 **4**

OR

$$\therefore Variance = \frac{\sum f_i x_i^2}{N} - \left(\frac{\sum f_i x_i}{N}\right)^2$$

$$= \frac{78500}{100} - \left(\frac{2500}{100}\right)^2$$

$$= 160$$

1

$$Coeff.\ of\ Variance = \frac{S.D.}{\bar{x}} \times 100$$

$$= \frac{12.649}{25} \times 100$$

$$= 50.596$$

1 **4**

OR

Que. No.	Sub. Que.	Model answers	Marks	Total Marks
6)		**OR**		

Class	xi	f_i	d_i	$f_i d_i$	d_i^2	$f_i d_i^2$
0-10	5	14	-2	-28	4	56
10-20	15	23	-1	-23	1	23
20-30	**25**	**27**	**0**	**0**	**0**	**0**
30-40	35	21	1	21	1	**21**
40-50	45	15	2	30	4	60
		100		**0**		**160**

1

$A = 25, \quad h = 10, \quad d_i = \dfrac{x_i - A}{h}$

$$\therefore \bar{x} = A + \frac{\sum f_i d_i}{N} \times h$$

$$= 25 + \frac{0}{100} \times 10$$

$$= 25$$

1

$$S.D. = h \times \sqrt{\frac{\sum f_i d_i^2}{N} - \left(\frac{\sum f_i d_i}{N}\right)^2}$$

$$= 10 \times \sqrt{\frac{160}{100} - \left(\frac{0}{100}\right)^2}$$

$$= 12.649$$

½

$$\therefore Variance = (S.D.)^2$$

$$= 12.649^2$$

$$= 159.997$$

½

$$Coeff.\ of\ Variance = \frac{S.D.}{\bar{x}} \times 100$$

$$= \frac{12.649}{25} \times 100$$

$$= 50.596$$

1 **4**

OR

$$\therefore Variance = h^2 \left[\frac{\sum f_i d_i^2}{N} - \left(\frac{\sum f_i d_i}{N}\right)^2\right]$$

$$= h^2 \left[\frac{160}{100} - \left(\frac{0}{100}\right)^2\right]$$

$$= 159.997$$

1

$$Coeff.\ of\ Variance = \frac{S.D.}{\bar{x}} \times 100 = \frac{12.649}{25} \times 100$$

$$= 50.596$$

1 **4**

Que. No.	Sub. Que.	Model answers	Marks	Total Marks
6)	f)	$C.V.(I)=\frac{\sigma}{\bar{x}}\times 100=\frac{7.3}{82.5}\times 100=8.848$	1	
		$C.V.(II)=\frac{\sigma}{\bar{x}}\times 100=\frac{8.35}{48.75}\times 100=17.12$	1	
		$\therefore C.V.(I)<C.V.(II)$	1	
		$\therefore$ Group $set\ II$ is more variable.	1	**4**

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.