Que. No.	Sub. Que.	Model Answers	Marks	Total Marks
		Important Instructions to the Examiners: 1) The Answers should be examined by key words and not as word-to-word as given in the model answer scheme. 2) The model answer and the answer written by candidate may vary but the examiner may try to assess the understanding level of the candidate. 3) The language errors such as grammatical, spelling errors should not be given more importance. (Not applicable for subject English and Communication Skills.) 4) While assessing figures, examiner may give credit for principal components indicated in the figure. The figures drawn by the candidate and those in the model answer may vary. The examiner may give credit for any equivalent figure drawn. 5) Credits may be given step wise for numerical problems. In some cases, the assumed constant values may vary and there may be some difference in the candidate's Answers and the model answer. 6) In case of some questions credit may be given by judgment on part of examiner of relevant answer based on candidate's understanding. 7) For programming language papers, credit may be given to any other program based on equivalent concept.		

Que. No.	Sub. Que.	Model Answers	Marks	Total Marks
1)		**Attempt any TEN of the following:**		
	a)	Find 'x', if $\begin{vmatrix} 1 & 2x & 4x^2 \\ 1 & 4 & 16 \\ 1 & 1 & 1 \end{vmatrix} = 0$		
	Ans.	$\begin{vmatrix} 1 & 2x & 4x^2 \\ 1 & 4 & 16 \\ 1 & 1 & 1 \end{vmatrix} = 0$		
		$\therefore 1(4-16) - 2x(1-16) + 4x^2(1-4) = 0$	½	
		$\therefore -12 + 30x - 12x^2 = 0$	½	
		$\therefore 2x^2 - 5x + 2 = 0$		
		$\therefore x = 2, \quad \frac{1}{2} \; or \; 0.5$	½+½	**2**
		OR		
		$\begin{vmatrix} 1 & 2x & 4x^2 \\ 1 & 4 & 16 \\ 1 & 1 & 1 \end{vmatrix} = 1(4-16) - 2x(1-16) + 4x^2(1-4)$	½	
		$= -12 + 30x - 12x^2$	½	
		$\therefore -12 + 30x - 12x^2 = 0$		
		$\therefore 2x^2 - 5x + 2 = 0$		
		$\therefore x = 2, \quad \frac{1}{2} \; or \; 0.5$	½+½	**2**
		--		
	b)	Find the value of $\begin{vmatrix} -1 & 2 \\ 3 & 2 \end{vmatrix} + \begin{vmatrix} -3 & -2 \\ -1 & 2 \end{vmatrix}$		
	Ans.	$\begin{vmatrix} -1 & 2 \\ 3 & 2 \end{vmatrix} + \begin{vmatrix} -3 & -2 \\ -1 & 2 \end{vmatrix} = -2 - 6 - 6 - 2$	1	
		$= -16$	1	**2**
		OR		
		$\begin{vmatrix} -1 & 2 \\ 3 & 2 \end{vmatrix} = -2 - 6 = -8$	½	
		$\begin{vmatrix} -3 & -2 \\ -1 & 2 \end{vmatrix} = -6 - 2 = -8$	½	
		$\begin{vmatrix} -1 & 2 \\ 3 & 2 \end{vmatrix} + \begin{vmatrix} -3 & -2 \\ -1 & 2 \end{vmatrix} = -8 - 8 = -16$	1	**2**

Que. No.	Sub. Que.	Model Answers	Marks	Total Marks
1)	c)	Find 'X' such that $2\left\{X+\begin{bmatrix}2 & -1 & 3\\ 4 & 2 & 0\end{bmatrix}\right\}=\begin{bmatrix}-1 & 0 & 1\\ 0 & -1 & 1\end{bmatrix}$		
	Ans.	$2\left\{X+\begin{bmatrix}2 & -1 & 3\\ 4 & 2 & 0\end{bmatrix}\right\}=\begin{bmatrix}-1 & 0 & 1\\ 0 & -1 & 1\end{bmatrix}$		
		$\therefore 2X+2\begin{bmatrix}2 & -1 & 3\\ 4 & 2 & 0\end{bmatrix}=\begin{bmatrix}-1 & 0 & 1\\ 0 & -1 & 1\end{bmatrix}$		
		$\therefore 2X=\begin{bmatrix}-1 & 0 & 1\\ 0 & -1 & 1\end{bmatrix}-2\begin{bmatrix}2 & -1 & 3\\ 4 & 2 & 0\end{bmatrix}$		
		$\therefore 2X=\begin{bmatrix}-1 & 0 & 1\\ 0 & -1 & 1\end{bmatrix}-\begin{bmatrix}4 & -2 & 6\\ 8 & 4 & 0\end{bmatrix}$	½	
		$\therefore 2X=\begin{bmatrix}-5 & 2 & -5\\ -8 & -5 & 1\end{bmatrix}$	1	
		$\therefore X=\frac{1}{2}\begin{bmatrix}-5 & 2 & -5\\ -8 & -5 & 1\end{bmatrix}$	½	**2**
		OR		
		$2\left\{X+\begin{bmatrix}2 & -1 & 3\\ 4 & 2 & 0\end{bmatrix}\right\}=\begin{bmatrix}-1 & 0 & 1\\ 0 & -1 & 1\end{bmatrix}$		
		$\therefore X+\begin{bmatrix}2 & -1 & 3\\ 4 & 2 & 0\end{bmatrix}=\frac{1}{2}\begin{bmatrix}-1 & 0 & 1\\ 0 & -1 & 1\end{bmatrix}$		
		$\therefore X=\frac{1}{2}\begin{bmatrix}-1 & 0 & 1\\ 0 & -1 & 1\end{bmatrix}-\begin{bmatrix}2 & -1 & 3\\ 4 & 2 & 0\end{bmatrix}$	½	
		$\therefore X=\begin{bmatrix}-\frac{1}{2} & 0 & \frac{1}{2}\\ 0 & -\frac{1}{2} & \frac{1}{2}\end{bmatrix}-\begin{bmatrix}2 & -1 & 3\\ 4 & 2 & 0\end{bmatrix}$	½	
		$\therefore X=\begin{bmatrix}-\frac{5}{2} & 2 & -\frac{5}{2}\\ -4 & -\frac{5}{2} & \frac{1}{2}\end{bmatrix}$	1	**2**
		--		
	d)	If $A=\begin{bmatrix}1 & -1\\ 3 & -4\end{bmatrix}$, find $\left\|A^T\right\|$		
	Ans.	$A^T=\begin{bmatrix}1 & 3\\ -1 & -4\end{bmatrix}$	1	
		$\left\|A^T\right\|=-4+3=-1$	1	**2**

Que. No.	Sub. Que.	Model Answers	Marks	Total Marks
1)	e)	If $A=\begin{bmatrix}\cos\alpha & \sin\alpha\\ -\sin\alpha & \cos\alpha\end{bmatrix}$, show that A is orthogonal matrix.		
	Ans.	$A^T=\begin{bmatrix}\cos\alpha & -\sin\alpha\\ \sin\alpha & \cos\alpha\end{bmatrix}$	½	
		$A\cdot A^T=\begin{bmatrix}\cos\alpha & \sin\alpha\\ -\sin\alpha & \cos\alpha\end{bmatrix}\begin{bmatrix}\cos\alpha & -\sin\alpha\\ \sin\alpha & \cos\alpha\end{bmatrix}$		
		$=\begin{bmatrix}\cos^2\alpha+\sin^2\alpha & -\cos\alpha\sin\alpha+\sin\alpha\cos\alpha\\ -\sin\alpha\cos\alpha+\cos\alpha\sin\alpha & \sin^2\alpha+\cos^2\alpha\end{bmatrix}$	1	
		$=\begin{bmatrix}1 & 0\\ 0 & 1\end{bmatrix}=I$	½	
		$\therefore$ A is orthogonal matrix.		**2**
		---		
	f)	Resolve into partial fractions: $\dfrac{1}{x^2-x}$		
	Ans.	$\dfrac{1}{x^2-x}=\dfrac{1}{x(x-1)}=\dfrac{A}{x}+\dfrac{B}{x-1}$		
		$\therefore \boxed{1=(x-1)A+xB}$		
		$Put\ \ x=0$		
		$\therefore 1=(0-1)A+0$		
		$\therefore 1=-A$		
		$\therefore \boxed{-1=A}$	1	
		$Put\ \ x-1=0 \qquad \therefore x=1$		
		$\therefore 1=0A+B$		
		$\therefore \boxed{1=B}$	½	
		$\therefore \boxed{\dfrac{1}{x^2-x}=\dfrac{-1}{x}+\dfrac{1}{x-1}}$	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.		

Que. No.	Sub. Que.	Model Answers	Marks	Total Marks
1)		**OR**		
		$\frac{1}{x^2-x}=\frac{1}{x(x-1)}=\frac{A}{x}+\frac{B}{x-1}$		
		$\therefore 1=(x-1)A+xB$		
		$\therefore 1=xA-A+xB$		
		$\therefore 0x+1=(A+B)x-A$		
		$\therefore A+B=0, \qquad -A=1$		
		$\therefore \boxed{A=-1}$	1	
		$\therefore B=-A=1$		
		$\therefore \boxed{B=1}$	½	
		$\therefore \boxed{\frac{1}{x^2-x}=\frac{-1}{x}+\frac{1}{x-1}}$	½	**2**
		Note: The above problem can also be solved as follows:		
		$\frac{1}{x^2-x}=\frac{1}{(x-1)x}=\frac{A}{x-1}+\frac{B}{x}$		
		In this case, we get		
		$\therefore \boxed{A=1} \qquad \boxed{B=-1}$		
		$\therefore \boxed{\frac{1}{x^2-x}=\frac{1}{x-1}+\frac{-1}{x}}$		
		---		
	g)	Express the following as product of trigonometric functions: $\sin 7\theta-\sin 5\theta$		
	Ans.	$\sin 7\theta-\sin 5\theta=2\cos\left(\frac{7\theta+5\theta}{2}\right)\sin\left(\frac{7\theta-5\theta}{2}\right)$	1	
		$=2\cos 6\theta\cdot\sin\theta$	1	**2**
		---		
	h)	Express as sum or difference of trigonometric functions: $2\cos 117^\circ\sin 53^\circ$		
	Ans.	$2\cos 117^\circ\sin 53^\circ=\sin(117^\circ+53^\circ)-\sin(117^\circ-53^\circ)$	1	
		$=\sin 170^\circ-\sin 64^\circ$	1	**2**

Que. No.	Sub. Que.	Model Answers	Marks	Total Marks
1)				
	i)	Prove that $\sin^{-1}(-x) = -\sin^{-1} x$		
	Ans.	$Let\ \sin^{-1}(x) = \theta$		
		$\therefore x = \sin\theta$		
		$\therefore -x = -\sin\theta$	½	
		$\therefore -x = \sin(-\theta)$	½	
		$\therefore \sin^{-1}(-x) = -\theta$	½	
		$\therefore \sin^{-1}(-x) = -\sin^{-1}(x)$	½	**2**
		---		
	j)	Prove that $\cos\left[\frac{\pi}{2} - \sin^{-1}\left(\frac{1}{2}\right)\right] = \frac{1}{2}$		
	Ans.	$\cos\left[\frac{\pi}{2} - \sin^{-1}\left(\frac{1}{2}\right)\right] = \cos\left[\frac{\pi}{2} - \frac{\pi}{6}\right]$	½	
		$= \cos\left[\frac{\pi}{3}\right]$	½	
		$= \frac{1}{2}\ \ or\ \ 0.5$	1	**2**
		OR		
		$\cos\left[\frac{\pi}{2} - \sin^{-1}\left(\frac{1}{2}\right)\right] = \cos\left[90^o - 30^o\right]$	½	
		$= \cos\left[60^o\right]$	½	
		$= \frac{1}{2}\ \ or\ \ 0.5$	1	**2**
		OR		
		$\sin^{-1}\left(\frac{1}{2}\right) = \frac{\pi}{6}$	½	
		$\therefore \cos\left[\frac{\pi}{2} - \sin^{-1}\left(\frac{1}{2}\right)\right] = \cos\left[\frac{\pi}{2} - \frac{\pi}{6}\right]$		
		$= \cos\left[\frac{\pi}{3}\right]$	½	
		$= \frac{1}{2}\ \ or\ \ 0.5$	1	**2**

Que. No.	Sub. Que.	Model Answers	Marks	Total Marks
1)	k)	Find the intercept made by the line $5x-3y=15$ on the coordinate axes.		
	Ans.	*Given* $5x-3y=15$ $\therefore 5x-3y-15=0$ $\therefore A=5,\quad B=-3,\quad C=-15$ $\therefore x-\text{int}=-\frac{C}{A}=-\frac{-15}{5}=3$	1	
		$y-\text{int}=-\frac{C}{B}=-\frac{-15}{-3}=-5$	1	**2**
		OR *Given* $5x-3y=15$ *For* $x-\text{int}$, *put* $y=0$ $\therefore 5x=15$ $\therefore x-\text{int}=\frac{15}{5}=3$	1	
		For $y-\text{int}$, *put* $x=0$ $\therefore -3y=15$ $\therefore y-\text{int}=\frac{15}{-3}=-5$	1	**2**
		OR *Given* $5x-3y=15$ $\therefore -3y=15-5x$ $\therefore y=-\frac{1}{3}(-5x+15)=\frac{5}{3}x-5$ $\therefore y-\text{int}=-5$	1	
		For $x-\text{int}$, *put* $y=0$ $\therefore 5x=15$ $\therefore x-\text{int}=\frac{15}{5}=3$	1	**2**
		--		
	l)	Show that the lines $2x+3y-1=0$ and $3x-2y+6=0$ are perpendicular.		
	Ans.	*i) For the line* $2x+3y-1=0$ $\therefore$ *slope* $m_1=-\frac{A}{B}=-\frac{2}{3}$	½	

Que. No.	Sub. Que.	Model Answers	Marks	Total Marks
1)		$ii)\ For\ the\ line\ 3x-2y+6=0$		
		$\therefore slope\ m_2=-\frac{A}{B}=-\frac{3}{-2}=\frac{3}{2}$	½	
		$\therefore m_1=-\frac{2}{3}=-\frac{1}{3/2}=-\frac{1}{m_2}$	½	
		$\therefore$ the lines are perpendicular.	½	**2**
		OR		
		$\therefore m_1\cdot m_2=-\frac{2}{3}\times\frac{3}{2}=-1$	½	
		$\therefore$ the lines are perpendicular.	½	**2**
		--		
2)		**Attempt any Four of the following.**		
	a)	Solve by determinant method: $2x-4y+3z=1,\ x-2y+4z=3,\ 3x-y+5z=2$		
	Ans.	$2x-4y+3z=1$ $x-2y+4z=3$ $3x-y+5z=2$		
		$D=\begin{vmatrix}2&-4&3\\1&-2&4\\3&-1&5\end{vmatrix}=2(-10+4)+4(5-12)+3(-1+6)$ $=-25$	1	
		$D_x=\begin{vmatrix}1&-4&3\\3&-2&4\\2&-1&5\end{vmatrix}=1(-10+4)+4(15-8)+3(-3+4)$ $=25$	½	
		$D_y=\begin{vmatrix}2&1&3\\1&3&4\\3&2&5\end{vmatrix}=2(15-8)-1(5-12)+3(2-9)$ $=0$	½	
		$D_z=\begin{vmatrix}2&-4&1\\1&-2&3\\3&-1&2\end{vmatrix}=2(-4+3)+4(2-9)+1(-1+6)$ $=-25$	½	

Que. No.	Sub. Que.	Model Answers	Marks	Total Marks
2)		$\therefore x=\frac{D_x}{D}=\frac{25}{-25}=-1$	½	
		$y=\frac{D_y}{D}=\frac{0}{-25}=0$	½	
		$z=\frac{D_z}{D}=\frac{-25}{-25}=1$	½	**4**
		--		
	b)	Find 'r' by using Cramer's rule: $4r+2t=4+7s,\ 3r-6s-7t=5,\ \ 2r-2t=-3-4s$		
	Ans.	$4r-7s+2t=4$		
		$3r-6s-7t=5$		
		$2r+4s-2t=-3$		
		$D=\begin{vmatrix}4&-7&2\\3&-6&-7\\2&4&-2\end{vmatrix}=4(12+28)+7(-6+14)+2(12+12)$		
		$=264$	1½	
		$D_r=\begin{vmatrix}4&-7&2\\5&-6&-7\\-3&4&-2\end{vmatrix}=4(12+28)+7(-10-21)+2(20-18)$		
		$=-53$	1½	
		$\therefore r=\frac{D_r}{D}=\frac{-53}{264}\ \ or\ \ -0.2007575...\ \ or\ \ -0.2008\ \ (rounded\ off\ value)$	1	**4**
		--		
	c)	If $A=\begin{bmatrix}1&2&6\\7&4&10\\1&3&5\end{bmatrix}$, find A^2-3A+I, where I is the unit matrix of order 2 (**in fact it must be 3**)		
	Ans.	$A^2=\begin{bmatrix}1&2&6\\7&4&10\\1&3&5\end{bmatrix}\begin{bmatrix}1&2&6\\7&4&10\\1&3&5\end{bmatrix}$		
		$=\begin{bmatrix}1+14+6&2+8+18&6+20+30\\7+28+10&14+16+30&42+40+50\\1+21+5&2+12+15&6+30+25\end{bmatrix}$	1	

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2)		$=\begin{bmatrix}21 & 28 & 56\\ 45 & 60 & 132\\ 27 & 29 & 61\end{bmatrix}$	1	
		$3A=3\begin{bmatrix}1 & 2 & 6\\ 7 & 4 & 10\\ 1 & 3 & 5\end{bmatrix}=\begin{bmatrix}3 & 6 & 18\\ 21 & 12 & 30\\ 3 & 9 & 15\end{bmatrix}$	1	
		$\therefore A^2-3A+I=\begin{bmatrix}21 & 28 & 56\\ 45 & 60 & 132\\ 27 & 29 & 61\end{bmatrix}-\begin{bmatrix}3 & 6 & 18\\ 21 & 12 & 30\\ 3 & 9 & 15\end{bmatrix}+\begin{bmatrix}1 & 0 & 0\\ 0 & 1 & 0\\ 0 & 0 & 1\end{bmatrix}$		
		$=\begin{bmatrix}19 & 22 & 38\\ 24 & 49 & 102\\ 24 & 20 & 47\end{bmatrix}$	1	**4**
		OR		
		$\therefore A^2-3A+I=\begin{bmatrix}1 & 2 & 6\\ 7 & 4 & 10\\ 1 & 3 & 5\end{bmatrix}\begin{bmatrix}1 & 2 & 6\\ 7 & 4 & 10\\ 1 & 3 & 5\end{bmatrix}-3\begin{bmatrix}1 & 2 & 6\\ 7 & 4 & 10\\ 1 & 3 & 5\end{bmatrix}+\begin{bmatrix}1 & 0 & 0\\ 0 & 1 & 0\\ 0 & 0 & 1\end{bmatrix}$		
		$=\begin{bmatrix}1+14+6 & 2+8+18 & 6+20+30\\ 7+28+10 & 14+16+30 & 42+40+50\\ 1+21+5 & 2+12+15 & 6+30+25\end{bmatrix}-\begin{bmatrix}3 & 6 & 18\\ 21 & 12 & 30\\ 3 & 9 & 15\end{bmatrix}+\begin{bmatrix}1 & 0 & 0\\ 0 & 1 & 0\\ 0 & 0 & 1\end{bmatrix}$	1+1	
		$=\begin{bmatrix}21 & 28 & 56\\ 45 & 60 & 132\\ 27 & 29 & 61\end{bmatrix}-\begin{bmatrix}3 & 6 & 18\\ 21 & 12 & 30\\ 3 & 9 & 15\end{bmatrix}+\begin{bmatrix}1 & 0 & 0\\ 0 & 1 & 0\\ 0 & 0 & 1\end{bmatrix}$	1	
		$=\begin{bmatrix}19 & 22 & 38\\ 24 & 49 & 102\\ 24 & 20 & 47\end{bmatrix}$	1	**4**
		--		
	d)	If $A=\begin{bmatrix}1 & 2\\ -2 & 3\end{bmatrix}$, $B=\begin{bmatrix}2 & 1\\ 2 & 3\end{bmatrix}$, $C=\begin{bmatrix}-3 & 1\\ 2 & 0\end{bmatrix}$, verify $(AB)C=A(BC)$.		
	Ans.	$AB=\begin{bmatrix}1 & 2\\ -2 & 3\end{bmatrix}\begin{bmatrix}2 & 1\\ 2 & 3\end{bmatrix}$		
		$=\begin{bmatrix}2+4 & 1+6\\ -4+6 & -2+9\end{bmatrix}$		
		$=\begin{bmatrix}6 & 7\\ 2 & 7\end{bmatrix}$	1	

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2)		$(AB)C=\begin{bmatrix}6&7\\2&7\end{bmatrix}\begin{bmatrix}-3&1\\2&0\end{bmatrix}$		
		$=\begin{bmatrix}-18+14&6+0\\-6+14&2+0\end{bmatrix}$		
		$=\begin{bmatrix}-4&6\\8&2\end{bmatrix}$	1	
		$BC=\begin{bmatrix}2&1\\2&3\end{bmatrix}\begin{bmatrix}-3&1\\2&0\end{bmatrix}$		
		$=\begin{bmatrix}-6+2&2+0\\-6+6&2+0\end{bmatrix}$		
		$=\begin{bmatrix}-4&2\\0&2\end{bmatrix}$	1	
		$A(BC)=\begin{bmatrix}1&2\\-2&3\end{bmatrix}\begin{bmatrix}-4&2\\0&2\end{bmatrix}$		
		$=\begin{bmatrix}-4+0&2+4\\8+0&-4+6\end{bmatrix}$		
		$=\begin{bmatrix}-4&6\\8&2\end{bmatrix}$	½	
		$\therefore (AB)C=A(BC)$	½	**4**
		OR		
		$(AB)C=\left\{\begin{bmatrix}1&2\\-2&3\end{bmatrix}\begin{bmatrix}2&1\\2&3\end{bmatrix}\right\}\begin{bmatrix}-3&1\\2&0\end{bmatrix}$		
		$=\begin{bmatrix}2+4&1+6\\-4+6&-2+9\end{bmatrix}\begin{bmatrix}-3&1\\2&0\end{bmatrix}$		
		$=\begin{bmatrix}6&7\\2&7\end{bmatrix}\begin{bmatrix}-3&1\\2&0\end{bmatrix}$	1	
		$=\begin{bmatrix}-18+14&6+0\\-6+14&2+0\end{bmatrix}$		
		$=\begin{bmatrix}-4&6\\8&2\end{bmatrix}$	1	
		$A(BC)=\begin{bmatrix}1&2\\-2&3\end{bmatrix}\left\{\begin{bmatrix}2&1\\2&3\end{bmatrix}\begin{bmatrix}-3&1\\2&0\end{bmatrix}\right\}$		
		$=\begin{bmatrix}1&2\\-2&3\end{bmatrix}\begin{bmatrix}-6+2&2+0\\-6+6&2+0\end{bmatrix}$		

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2)		$=\begin{bmatrix}1 & 2\\-2 & 3\end{bmatrix}\begin{bmatrix}-4 & 2\\0 & 2\end{bmatrix}$	1	
		$=\begin{bmatrix}-4+0 & 2+4\\8+0 & -4+6\end{bmatrix}$		
		$=\begin{bmatrix}-4 & 6\\8 & 2\end{bmatrix}$	½	
		$\therefore (AB)C = A(BC)$	½	**4**
	e)	If $A=\begin{bmatrix}1 & -3\\2 & -1\end{bmatrix}$, $B=\begin{bmatrix}1 & 0 & 1\\2 & -1 & 3\end{bmatrix}$, prove that $(AB)^T = B^T A^T$.		
	Ans.	$AB=\begin{bmatrix}1 & -3\\2 & -1\end{bmatrix}\begin{bmatrix}1 & 0 & 1\\2 & -1 & 3\end{bmatrix}$		
		$=\begin{bmatrix}-5 & 3 & -8\\0 & 1 & -1\end{bmatrix}$	1	
		$(AB)^T=\begin{bmatrix}-5 & 0\\3 & 1\\-8 & -1\end{bmatrix}$	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		
		$(AB)^T=\left\{\begin{bmatrix}1 & -3\\2 & -1\end{bmatrix}\begin{bmatrix}1 & 0 & 1\\2 & -1 & 3\end{bmatrix}\right\}^T$		
		$=\left\{\begin{bmatrix}-5 & 3 & -8\\0 & 1 & -1\end{bmatrix}\right\}^T$	1	
		$=\begin{bmatrix}-5 & 0\\3 & 1\\-8 & -1\end{bmatrix}$	1	
		$B^T A^T=\begin{bmatrix}1 & 2\\0 & -1\\1 & 3\end{bmatrix}\begin{bmatrix}1 & 2\\-3 & -1\end{bmatrix}$	1	
		$=\begin{bmatrix}-5 & 0\\3 & 1\\-8 & -1\end{bmatrix}$	1	**4**

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2)	f)	Resolve into partial fractions: $\frac{x^2+1}{x^2-1}$.		
	Ans.	$\frac{x^2+1}{x^2-1}=1+\frac{2}{x^2-1}$	1	
		$\frac{2}{x^2-1}=\frac{2}{(x-1)(x+1)}=\frac{A}{x-1}+\frac{B}{x+1}$		
		$\therefore 2=(x-1)(x+1)\left[\frac{A}{x-1}+\frac{B}{x+1}\right]$		
		$\therefore 2=(x+1)A+(x-1)B$		
		$Put\ x-1=0 \quad \therefore x=1$		
		$\therefore 2=(1+1)A+0$		
		$\therefore 2=2A$		
		$\therefore 1=A$	1	
		$Put\ x+1=0 \quad \therefore x=-1$		
		$\therefore 2=0+(-1-1)B$		
		$\therefore 2=-2B$		
		$\therefore -1=B$	1	
		$\therefore \frac{2}{x^2-1}\ or\ \frac{2}{(x-1)(x+1)}=\frac{1}{x-1}+\frac{-1}{x+1}$	½	
		$\therefore \frac{x^2+1}{x^2-1}=1+\frac{1}{x-1}+\frac{-1}{x+1}$	½	**4**
		--		
3)		**Attempt any Four of the following.**		
	a)	Express the matrix A as the sum of symmetric and skew symmetric matrix where $A=\begin{bmatrix}4 & 2 & -3\\ 1 & 3 & -6\\ -5 & 0 & -7\end{bmatrix}$		
	Ans.	$A^T=\begin{bmatrix}4 & 1 & -5\\ 2 & 3 & 0\\ -3 & -6 & -7\end{bmatrix}$	1	
		$A+A^T=\begin{bmatrix}4 & 2 & -3\\ 1 & 3 & -6\\ -5 & 0 & -7\end{bmatrix}+\begin{bmatrix}4 & 1 & -5\\ 2 & 3 & 0\\ -3 & -6 & -7\end{bmatrix}$		

Que. No.	Sub. Que.	Model Answers	Marks	Total Marks
3)		$=\begin{bmatrix} 8 & 3 & -8 \\ 3 & 6 & -6 \\ -8 & -6 & -14 \end{bmatrix}$	1	
		$A-A^T=\begin{bmatrix} 4 & 2 & -3 \\ 1 & 3 & -6 \\ -5 & 0 & -7 \end{bmatrix}-\begin{bmatrix} 4 & 1 & -5 \\ 2 & 3 & 0 \\ -3 & -6 & -7 \end{bmatrix}$		
		$=\begin{bmatrix} 0 & 1 & 2 \\ -1 & 0 & -6 \\ -2 & 6 & 0 \end{bmatrix}$	1	
		$\therefore A=\frac{1}{2}\left(A+A^T\right)+\frac{1}{2}\left(A-A^T\right)$		
		$=\frac{1}{2}\begin{bmatrix} 8 & 3 & -8 \\ 3 & 6 & -6 \\ -8 & -6 & -14 \end{bmatrix}+\frac{1}{2}\begin{bmatrix} 0 & 1 & 2 \\ -1 & 0 & -6 \\ -2 & 6 & 0 \end{bmatrix}$	1	**4**
		OR		
		$\therefore A=\frac{1}{2}\left(A+A^T\right)+\frac{1}{2}\left(A-A^T\right)$		
		$=\frac{1}{2}\left\{\begin{bmatrix} 4 & 2 & -3 \\ 1 & 3 & -6 \\ -5 & 0 & -7 \end{bmatrix}+\begin{bmatrix} 4 & 1 & -5 \\ 2 & 3 & 0 \\ -3 & -6 & -7 \end{bmatrix}\right\}+\frac{1}{2}\left\{\begin{bmatrix} 4 & 2 & -3 \\ 1 & 3 & -6 \\ -5 & 0 & -7 \end{bmatrix}-\begin{bmatrix} 4 & 1 & -5 \\ 2 & 3 & 0 \\ -3 & -6 & -7 \end{bmatrix}\right\}$	1+1	
		$=\frac{1}{2}\begin{bmatrix} 8 & 3 & -8 \\ 3 & 6 & -6 \\ -8 & -6 & -14 \end{bmatrix}+\frac{1}{2}\begin{bmatrix} 0 & 1 & 2 \\ -1 & 0 & -6 \\ -2 & 6 & 0 \end{bmatrix}$	1+1	**4**
		---		
	b)	Find A^{-1} by adjoint method, if $A=\begin{bmatrix} 2 & -1 & 0 \\ 1 & 0 & 4 \\ 1 & -1 & 1 \end{bmatrix}$		
	Ans.	$\lvert A\rvert=2(0+4)+1(1-4)+0$		
		$=5$	½	
		$\therefore A^{-1}$ *exists.*		

Que. No.	Sub. Que.	Model Answers	Marks	Total Marks
3)		Matrix of Cofactor of A is,		
		$C(A)=\begin{bmatrix} \begin{vmatrix} 0 & 4 \\ -1 & 1 \end{vmatrix} & -\begin{vmatrix} 1 & 4 \\ 1 & 1 \end{vmatrix} & \begin{vmatrix} 1 & 0 \\ 1 & -1 \end{vmatrix} \\ -\begin{vmatrix} -1 & 0 \\ -1 & 1 \end{vmatrix} & \begin{vmatrix} 2 & 0 \\ 1 & 1 \end{vmatrix} & -\begin{vmatrix} 2 & -1 \\ 1 & -1 \end{vmatrix} \\ \begin{vmatrix} -1 & 0 \\ 0 & 4 \end{vmatrix} & -\begin{vmatrix} 2 & 0 \\ 1 & 4 \end{vmatrix} & \begin{vmatrix} 2 & -1 \\ 1 & 0 \end{vmatrix} \end{bmatrix}$ ---(*)	½	
		$=\begin{bmatrix} 4 & 3 & -1 \\ 1 & 2 & 1 \\ -4 & -8 & 1 \end{bmatrix}$	1½	
		$adj(A)=\begin{bmatrix} 4 & 1 & -4 \\ 3 & 2 & -8 \\ -1 & 1 & 1 \end{bmatrix}$	½	
		$\therefore A^{-1}=\frac{1}{\lvert A \rvert} adj(A)$		
		$=\frac{1}{5}\begin{bmatrix} 4 & 1 & -4 \\ 3 & 2 & -8 \\ -1 & 1 & 1 \end{bmatrix}$	1	**4**
		(*) Note: In the matrix *C(A)*, if 1 to 3 elements are wrong (either in sign or value), deduct ½ mark, if 4 to 6 elements are wrong, deduct 1½ marks, if 7 to 9 are wrong, deduct all the 2 marks. Further, if all the elements in the last i.e., *adj (A)* are correct, then only give ½ mark.		
		OR		
		Matrix of Cofactor of A is,		
		$M(A)=\begin{bmatrix} \begin{vmatrix} 0 & 4 \\ -1 & 1 \end{vmatrix} & \begin{vmatrix} 1 & 4 \\ 1 & 1 \end{vmatrix} & \begin{vmatrix} 1 & 0 \\ 1 & -1 \end{vmatrix} \\ \begin{vmatrix} -1 & 0 \\ -1 & 1 \end{vmatrix} & \begin{vmatrix} 2 & 0 \\ 1 & 1 \end{vmatrix} & \begin{vmatrix} 2 & -1 \\ 1 & -1 \end{vmatrix} \\ \begin{vmatrix} -1 & 0 \\ 0 & 4 \end{vmatrix} & \begin{vmatrix} 2 & 0 \\ 1 & 4 \end{vmatrix} & \begin{vmatrix} 2 & -1 \\ 1 & 0 \end{vmatrix} \end{bmatrix}$ ---(*)	½	
		$=\begin{bmatrix} 4 & -3 & -1 \\ -1 & 2 & -1 \\ -4 & 8 & 1 \end{bmatrix}$	1	

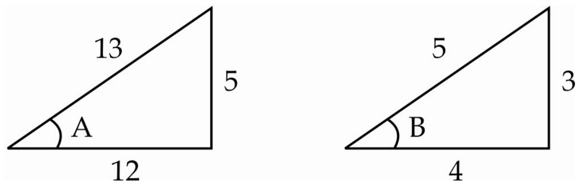
Que. No.	Sub. Que.	Model Answers	Marks	Total Marks
3)		$C(A)=\begin{bmatrix}4 & 3 & -1\\ 1 & 2 & 1\\ -4 & -8 & 1\end{bmatrix}$	½	
		OR		
		$A_{11}=\begin{vmatrix}0 & 4\\ -1 & 1\end{vmatrix}$ $A_{12}=-\begin{vmatrix}1 & 4\\ 1 & 1\end{vmatrix}$ $A_{13}=\begin{vmatrix}1 & 0\\ 1 & -1\end{vmatrix}$ $A_{21}=-\begin{vmatrix}-1 & 0\\ -1 & 1\end{vmatrix}$ $A_{22}=\begin{vmatrix}2 & 0\\ 1 & 1\end{vmatrix}$ $A_{23}=-\begin{vmatrix}2 & -1\\ 1 & -1\end{vmatrix}$ $A_{31}=\begin{vmatrix}-1 & 0\\ 0 & 4\end{vmatrix}$ $A_{32}=-\begin{vmatrix}2 & 0\\ 1 & 4\end{vmatrix}$ $A_{33}=\begin{vmatrix}2 & -1\\ 1 & 0\end{vmatrix}$	1½	
		Note: In the above, if 1 to 3 elements are wrong, deduct ½ mark, if 4 to 6 elements are wrong, deduct 1 marks, and if 7 to 9 are wrong, deduct all the marks. Further, if all the elements in the following matrices C(A) and adj (A) are correct, then only give the marks.		
		--		
	c)	Solve by matrix method: $x+y+z=3,\quad 3x-2y+3z=4,\quad 5x+5y+z=11$		
	Ans.	$x+y+z=3$ $3x-2y+3z=4$ $5x+5y+z=11$ $\therefore A=\begin{bmatrix}1 & 1 & 1\\ 3 & -2 & 3\\ 5 & 5 & 1\end{bmatrix},\quad X=\begin{bmatrix}x\\ y\\ z\end{bmatrix},\quad B=\begin{bmatrix}3\\ 4\\ 11\end{bmatrix}$		
		$\therefore \lvert A\rvert=1(-2-15)-1(3-15)+1(15+10)$ $=20$	½	
		$\therefore adj(A)=\begin{bmatrix}-17 & 4 & 5\\ 12 & -4 & 0\\ 25 & 0 & -5\end{bmatrix}$ ----------(*)	1	

Que. No.	Sub. Que.	Model Answers	Marks	Total Marks
1)		$\therefore A^{-1}=\frac{1}{\|A\|}adj(A)$ $=\frac{1}{20}\begin{bmatrix}-17&4&5\\12&-4&0\\25&0&-5\end{bmatrix}$	1	
		$\therefore$ 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 $adj(A)$ as discussed in the Q. 3 (b). Please give appropriate marks in accordance with the scheme of marking as discussed therein.		
		--		
	d)	Resolve into partial fractions: $\frac{3x^2+17x+14}{x^3-8}$.		
	Ans.	$\frac{3x^2+17x+14}{x^3-8}=\frac{3x^2+17x+14}{(x-2)(x^2+2x+4)}=\frac{A}{x-2}+\frac{Bx+C}{x^2+2x+4}$ $\therefore 3x^2+17x+14=(x-2)(x^2+2x+4)\left[\frac{A}{x-2}+\frac{Bx+C}{x^2+2x+4}\right]$ $\therefore 3x^2+17x+14=(x^2+2x+4)A+(x-2)(Bx+C)$ $Put\ \ x-2=0 \qquad \therefore x=2$ $\therefore 3(2)^2+17(2)+14=(2^2+2(2)+4)A+0$ $\therefore 60=12A$ $\therefore 5=A$	1	

Que. No.	Sub. Que.	Model Answers	Marks	Total Marks
3)		*Put* $x=0$ $\therefore 3(0)^2+17(0)+14=(0^2+2(0)+4)A+(0-2)(0+C)$ $\therefore 14=4A-2C$ $\therefore 14=4(5)-2C$ $\therefore -6=-2C$ $\therefore 3=C$	1	
		Put $x=1$ $\therefore 3+17+14=(1+2+4)A+(1-2)(B+C)$ $\therefore 34=7A-B-C$ $\therefore 34=35-B-3$ $\therefore 2=-B$ $\therefore -2=B$	1	
		$\dfrac{3x^2+17x+14}{x^3-8}=\dfrac{5}{x-2}+\dfrac{-2x+3}{x^2+2x+4}$	1	**4**
		Note for Partial Fraction Methods: The above Q. 3 (d) problem of partial fractions could be solved by the method of "equating equal power coefficients" also. This method, illustrated in the solution of Q. 1 (f), is also applicable. Give appropriate marks in accordance with the scheme of marking. As this method is very tedious and complicated, hardly someone use this method in such cases. So such solution methods for partial fraction problems Q. 3 (d), (e) & (f) are not illustrated herein. --		
	e)	Resolve into partial fractions: $\dfrac{x^2-2x+3}{x^3+x}$		
	Ans.	$\dfrac{x^2-2x+3}{x^3+x}=\dfrac{x^2-2x+3}{x(x^2+1)}=\dfrac{A}{x}+\dfrac{Bx+C}{x^2+1}$ $\therefore \boxed{x^2-2x+3=(x^2+1)A+x(Bx+C)}$ *Put* $x=0$ $\therefore 0^2-2(0)+3=(0^2+1)A+0$ $\therefore \boxed{3=A}$	1	
		Put $x=1$ $\therefore 1^2-2(1)+3=(1^2+1)A+1(B+C)$		

Que. No.	Sub. Que.	Model Answers	Marks	Total Marks
3)		$\therefore 2 = 2A + B + C$		
		$\therefore 2 = 6 + B + C$		
		$\therefore B + C = -4$		
		$Put\ x = 2$		
		$\therefore 2^2 - 2(2) + 3 = (2^2 + 1)A + 2(2B + C)$		
		$\therefore 3 = 5A + 4B + 2C$		
		$\therefore 3 = 15 + 4B + 2C$		
		$\therefore 4B + 2C = -12$		
		$\therefore 4B + 2C = -12$		
		$2B + 2C = -8$		
		$-\quad -\quad +$		
		$2B = -4$	1	
		$\therefore \boxed{B = -2}$		
		$\therefore C = -4 - B = -4 + 2$	1	
		$\therefore \boxed{C = -2}$		
		$\therefore \boxed{\frac{x^2 - 2x + 3}{x^3 + x} = \frac{3}{x} + \frac{-2x - 2}{x^2 + 1}}$	1	**4**
		--		
	f)	Resolve into partial fractions: $\frac{2x^4 + x^2 + 4}{(x^2 + 1)(x^2 - 2)(2x^2 + 3)}$		
	Ans.	$x^2 = y$		
		$\therefore \frac{2x^4 + x^2 + 4}{(x^2 + 1)(x^2 - 2)(2x^2 + 3)}$		
		$= \frac{2y^2 + y + 4}{(y + 1)(y - 2)(2y + 3)} = \frac{A}{y + 1} + \frac{B}{y - 2} + \frac{C}{2y + 3}$		
		$\therefore 2y^2 + y + 4 = (y + 1)(y - 2)(2y + 3)\left[\frac{A}{y + 1} + \frac{B}{y - 2} + \frac{C}{2y + 3}\right]$		
		$\therefore 2y^2 + y + 4 = (y - 2)(2y + 3)A + (y + 1)(2y + 3)B + (y + 1)(y - 2)C$		
		$Put\ \ y + 1 = 0 \quad \therefore y = -1$		
		$\therefore 2(-1)^2 - 1 + 4 = (-1 - 2)(-2 + 3)A + 0 + 0$		
		$\therefore 5 = -3A$		
		$\therefore -\frac{5}{3} = A$	1	

Que. No.	Sub. Que.	Model Answers	Marks	Total Marks
3)		$Put\ y-2=0 \quad \therefore y=2$ $\therefore 2(2)^2+2+4=0+(2+1)(4+3)B+0$ $\therefore 14=21B$ $\therefore \frac{2}{3}=B$	1	
		$Put\ 2y+3=0 \ \therefore y=-\frac{3}{2}$ $\therefore 2\left(-\frac{3}{2}\right)^2-\frac{3}{2}+4=0+0B+\left(-\frac{3}{2}+1\right)\left(-\frac{3}{2}-2\right)C$ $\therefore 7=\frac{7}{4}C$ $\therefore 4=C$	1	
		$\therefore \frac{2y^2+y+4}{(y+1)(y-2)(2y+3)}=\frac{-\frac{5}{3}}{y+1}+\frac{\frac{2}{3}}{y-2}+\frac{4}{2y+3}$	½	
		$\therefore \frac{2x^4+x^2+4}{(x^2+1)(x^2-2)(2x^2+3)}=\frac{-\frac{5}{3}}{x^2+1}+\frac{\frac{2}{3}}{x^2-2}+\frac{4}{2x^2+3}$	½	**4**
		---		
4)		**Attempt any Four of the following:**		
	a)	Prove that $\frac{\cot\theta-\cot 2\theta}{\cot\theta+\cot 2\theta}=\frac{\sin\theta}{\sin 3\theta}$		
	Ans.	$\frac{\cot\theta-\cot 2\theta}{\cot\theta+\cot 2\theta}=\frac{\frac{\cos\theta}{\sin\theta}-\frac{\cos 2\theta}{\sin 2\theta}}{\frac{\cos\theta}{\sin\theta}+\frac{\cos 2\theta}{\sin 2\theta}}$	1	
		$=\frac{\frac{\sin 2\theta\cos\theta-\sin\theta\cos 2\theta}{\sin\theta\sin 2\theta}}{\frac{\sin 2\theta\cos\theta+\sin\theta\cos 2\theta}{\sin\theta\sin 2\theta}}$	1	
		$=\frac{\sin(2\theta-\theta)}{\sin(2\theta+\theta)}$	1	
		$=\frac{\sin\theta}{\sin 3\theta}$	1	**4**

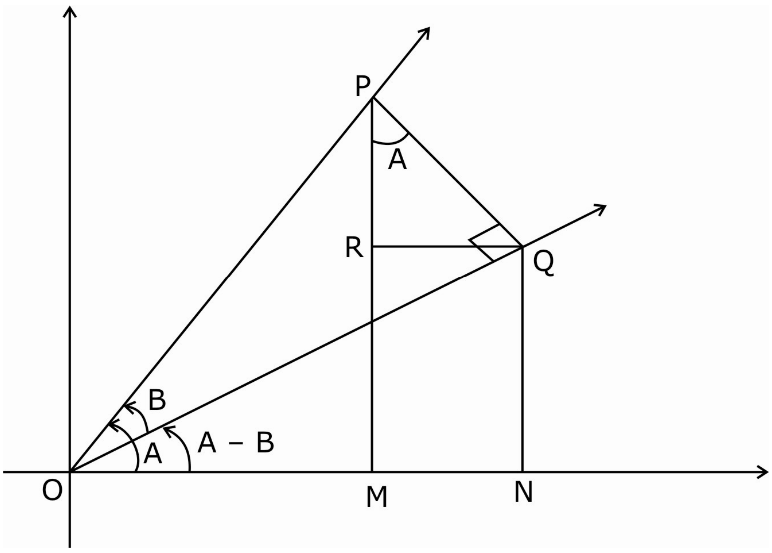
Que. No.	Sub. Que.	Model Answers	Marks	Total Marks
4)	b)	If A and B are obtuse angles and $\sin A=\frac{5}{13},\ \cos B=-\frac{4}{5}$, evaluate $\cos\left(A+B\right)$.		
	Ans.	$\sin A=\frac{5}{13},\ \cos B=-\frac{4}{5}$		
		As A and B are abtuse angles, $\cos A$ is negative and $\sin B$ is positive.		
		$\therefore \cos A=-\sqrt{1-\sin^2 A}=-\sqrt{1-\left(\frac{5}{13}\right)^2}=-\frac{12}{13}$	1	
		$\sin B=+\sqrt{1-\cos^2 B}=+\sqrt{1-\left(-\frac{4}{5}\right)^2}=\frac{3}{5}$	1	
		$\therefore \cos\left(A+B\right)=\cos A\cos B-\sin A\sin B$		
		$=-\frac{12}{13}\cdot\left(-\frac{4}{5}\right)-\frac{5}{13}\cdot\frac{3}{5}$	1	
		$=\frac{33}{65}$	1	**4**
		OR		
		$\sin A=\frac{5}{13}$ $\qquad$ $\cos B=-\frac{4}{5}$		
				
		As A and B are abtuse angles, $\cos A$ is negative and $\sin B$ is positive.		
		$\therefore \cos A=-\frac{12}{13}$	1	
		$\sin B=\frac{3}{5}$	1	
		$\therefore \cos\left(A+B\right)=\cos A\cos B-\sin A\sin B$		
		$=-\frac{12}{13}\cdot\left(-\frac{4}{5}\right)-\frac{5}{13}\cdot\frac{3}{5}$	1	
		$=\frac{33}{65}$	1	**4**
		--		

Que. No.	Sub. Que.	Model Answers	Marks	Total Marks
4)	c)	In any triangle ABC, prove that $\tan A+\tan B+\tan C=\tan A\tan B\tan C$		
	Ans.	*We have,* $A+B+C=180^{o}$ *or* π $\therefore A+B=180^{o}-C$ $\therefore \tan(A+B)=\tan(180^{o}-C)$ $\therefore \dfrac{\tan A+\tan B}{1-\tan A\tan B}=-\tan C$ $\therefore \tan A+\tan B=-\tan C[1-\tan A\tan B]$ $\therefore \tan A+\tan B=-\tan C+\tan A\tan B\tan C$ $\therefore \tan A+\tan B+\tan C=\tan A\tan B\tan C$	 1 1 1 1	 **4**
		Note: Instead of taking $A+B=180^{o}-C$, the problem can also be solved by taking either $A+C=180^{o}-B$ or $B+C=180^{o}-A$. ---		
	d)	Find the value of $\sin(-690^{o})\cos(-330^{o})+\cos(-750^{o})\sin(-240^{o})$		
	Ans.	$\sin(-690^{o})=-\sin(690^{o})$ $=-\sin(630^{o}+60^{o})$ *or* $-\sin(720^{o}-30^{o})$ $=-\sin(7\times90^{o}+60^{o})$ *or* $-\sin(8\times90^{o}-30^{o})$ $=\cos60^{o}$ *or* $\sin30^{o}$ $=\dfrac{1}{2}$ *OR* $\sin(-690^{o})=\sin(-2\times360^{o}+30^{o})=\sin30^{o}=\dfrac{1}{2}$	1	
		$\cos(-330^{o})=\cos330^{o}$ $=\cos(4\times90^{o}-30^{o})$ *or* $\cos(3\times90^{o}+60^{o})$ $=\cos30^{o}$ *or* $\sin60^{o}$ $=\dfrac{\sqrt{3}}{2}$	½	
		$\cos(-750^{o})=\cos750^{o}$ $=\cos(8\times90^{o}+30^{o})$ *or* $\cos(9\times90^{o}-60^{o})$ $=\cos30^{o}$ *or* $\sin60^{o}$ $=\dfrac{\sqrt{3}}{2}$	1	

Que. No.	Sub. Que.	Model Answers	Marks	Total Marks
4)				
		$\sin(-240^\circ) = -\sin(240^\circ)$		
		$= -\sin(2\times 90^\circ + 60^\circ)$ *or* $-\sin(3\times 90^\circ - 30^\circ)$		
		$= \sin 60^\circ$ *or* $\cos 30^\circ$		
		$= \dfrac{\sqrt{3}}{2}$	½	
		$\sin(-690^\circ)\cos(-330^\circ) + \cos(-750^\circ)\sin(-240^\circ)$		
		$= \dfrac{1}{2}\cdot\dfrac{\sqrt{3}}{2} + \dfrac{\sqrt{3}}{2}\cdot\dfrac{\sqrt{3}}{2}$		
		$= \dfrac{\sqrt{3}+3}{4}$	1	**4**
		OR		
		By taking the various combinations of the above different trigonometric ratios, students may solve the problem as per his/her convenience by taking all the ratios together. One of them is illustrated for the sake of scheme of marking:		
		$\sin(-690^\circ)\cos(-330^\circ) + \cos(-750^\circ)\sin(-240^\circ)$		
		$= \left[-\sin(7\times 90^\circ + 60^\circ)\right]\left[\cos(4\times 90^\circ - 30^\circ)\right] +$		
		$\left[\cos(8\times 90^\circ + 30^\circ)\right]\left[-\sin(2\times 90^\circ + 60^\circ)\right]$	1	
		$= \cos 60^\circ \cos 30^\circ + \cos 30^\circ \sin 60^\circ$	1	
		$= \dfrac{1}{2}\cdot\dfrac{\sqrt{3}}{2} + \dfrac{\sqrt{3}}{2}\cdot\dfrac{\sqrt{3}}{2}$	1	
		$= \dfrac{\sqrt{3}+3}{4}$	1	**4**
		--		
	e)	Prove that $\dfrac{\cos 3A + 2\cos 5A + \cos 7A}{\cos A + 2\cos 3A + \cos 5A} = \cos 2A - \sin 2A \tan 3A$		
	Ans.	$\dfrac{\cos 3A + 2\cos 5A + \cos 7A}{\cos A + 2\cos 3A + \cos 5A} = \dfrac{(\cos 3A + \cos 7A) + 2\cos 5A}{(\cos A + \cos 5A) + 2\cos 3A}$		
		$= \dfrac{2\cos 5A\cos(-2A) + 2\cos 5A}{2\cos 3A\cos(-2A) + 2\cos 3A}$	1	
		$= \dfrac{2\cos 5A\left[\cos(-2A)+1\right]}{2\cos 3A\left[\cos(-2A)+1\right]}$		
		$= \dfrac{\cos 5A}{\cos 3A}$	1	

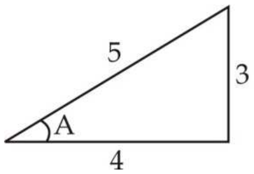
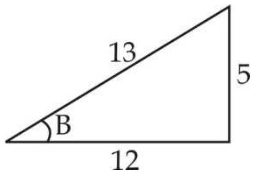
Que. No.	Sub. Que.	Model Answers	Marks	Total Marks
5)		$=\dfrac{\cos(2A+3A)}{\cos 3A}$		
		$=\dfrac{\cos 2A\cos 3A-\sin 2A\sin 3A}{\cos 3A}$	1	
		$=\cos 2A-\sin 2A\tan 3A$	1	**4**
		OR		
		$\dfrac{\cos 3A+2\cos 5A+\cos 7A}{\cos A+2\cos 3A+\cos 5A}=\dfrac{(\cos 7A+\cos 3A)+2\cos 4A}{(\cos 5A+\cos A)+2\cos 3A}$		
		$=\dfrac{2\cos 5A\cos 2A+2\cos 4A}{2\cos 3A\cos 2A+2\cos 3A}$	1	
		$=\dfrac{2\cos 5A[\cos 2A+1]}{2\cos 3A[\cos 2A+1]}$		
		$=\dfrac{\cos 5A}{\cos 3A}$	1	
		$=\dfrac{\cos(2A+3A)}{\cos 3A}$		
		$=\dfrac{\cos 2A\cos 3A-\sin 2A\sin 3A}{\cos 3A}$	1	
		$=\cos 2A-\sin 2A\tan 3A$	1	**4**
		OR		
		$\dfrac{\cos 3A+2\cos 5A+\cos 7A}{\cos A+2\cos 3A+\cos 5A}=\dfrac{\cos 3A+\cos 5A+\cos 5A+\cos 7A}{\cos A+\cos 3A+\cos 3A+\cos 5A}$		
		$=\dfrac{2\cos 4A\cos A+2\cos 6A\cos A}{2\cos 2A\cos A+2\cos 4A\cos A}$	1	
		$=\dfrac{2\cos A(\cos 4A+\cos 6A)}{2\cos A(\cos 2A+\cos 4A)}$		
		$=\dfrac{\cos 4A+\cos 6A}{\cos 2A+\cos 4A}$	½	
		$=\dfrac{2\cos 5A\cos A}{2\cos 3A\cos A}$		
		$=\dfrac{\cos 5A}{\cos 3A}$	½	
		$=\dfrac{\cos(2A+3A)}{\cos 3A}$		
		$=\dfrac{\cos 2A\cos 3A-\sin 2A\sin 3A}{\cos 3A}$	1	
		$=\cos 2A-\sin 2A\tan 3A$	1	**4**

Que. No.	Sub. Que.	Model Answers	Marks	Total Marks
1)		**OR**		
		$LHS = \dfrac{\cos 3A + 2\cos 5A + \cos 7A}{\cos A + 2\cos 3A + \cos 5A}$		
		$= \dfrac{(\cos 3A + \cos 7A) + 2\cos 5A}{(\cos A + \cos 5A) + 2\cos 3A}$		
		$= \dfrac{2\cos 5A \cos(-2A) + 2\cos 5A}{2\cos 3A \cos(-2A) + 2\cos 3A}$	1	
		$= \dfrac{2\cos 5A[\cos(-2A)+1]}{2\cos 3A[\cos(-2A)+1]}$		
		$= \dfrac{\cos 5A}{\cos 3A}$	1	
		$RHS = \cos 2A - \sin 2A \tan 3A$		
		$= \cos 2A - \sin 2A \cdot \dfrac{\sin 3A}{\cos 3A}$		
		$= \dfrac{\cos 2A \cos 3A - \sin 2A \sin 3A}{\cos 3A}$	1	
		$= \dfrac{\cos(2A+3A)}{\cos 3A}$		
		$= \dfrac{\cos 5A}{\cos 3A}$	1	**4**
		$\therefore LHS = RHS$		
		--		
	f)	Prove that $\tan^{-1}(1) + \tan^{-1}(2) + \tan^{-1}(3) = \pi$		
	Ans.	$\tan^{-1}(1) + \tan^{-1}(2) + \tan^{-1}(3) = \pi + \tan^{-1}\left(\dfrac{1+2}{1-1\cdot 2}\right) + \tan^{-1}(3)$	1	
		$= \pi + \tan^{-1}(-3) + \tan^{-1}(3)$	1	
		$= \pi - \tan^{-1}(3) + \tan^{-1}(3)$	1	
		$= \pi$	1	**4**
		OR		
		$\tan^{-1}(1) + \tan^{-1}(2) + \tan^{-1}(3) = \tan^{-1}(1) + \pi + \tan^{-1}\left(\dfrac{2+3}{1-2\cdot 3}\right)$	1	
		$= \tan^{-1}(1) + \pi + \tan^{-1}(-1)$	1	
		$= \tan^{-1}(1) + \pi - \tan^{-1}(1)$	1	
		$= \pi$	1	**4**

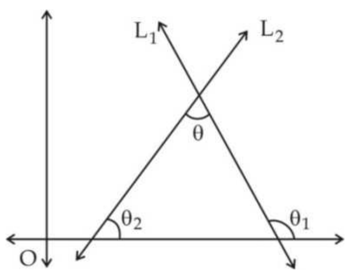
Que. No.	Sub. Que.	Model Answers	Marks	Total Marks
5)		**Attempt any Four of the following.**		
	a)	Prove that $\cos\left(A-B\right)=\cos A\cos B+\sin A\sin B$		
			1	
		$\cos(A-B)=\dfrac{ON}{OQ}$		
		$=\dfrac{OM+MN}{OQ}$	1	
		$=\dfrac{OM+RQ}{OQ}$		
		$=\dfrac{OM}{OQ}+\dfrac{RQ}{OQ}$		
		$=\dfrac{OM}{OP}\times\dfrac{OP}{OQ}+\dfrac{RQ}{PQ}\times\dfrac{PQ}{OQ}$	1	
		$=\cos A.\cos B+\sin A.\sin B$	1	**4**
		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.		

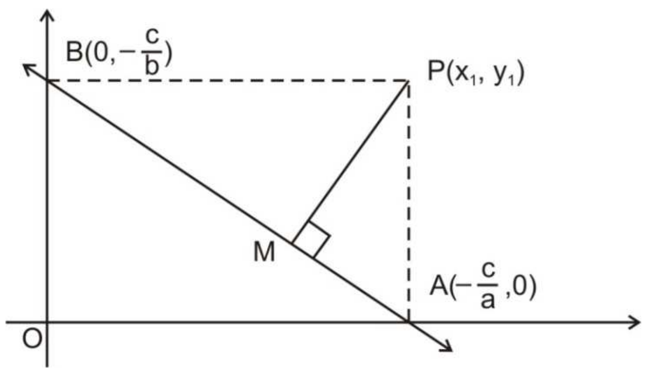
Que. No.	Sub. Que.	Model Answers	Marks	Total Marks
5)	b)	Prove that $\tan(A+B)=\dfrac{\tan A+\tan B}{1-\tan A\tan B}$		
	Ans.	$\tan(A+B)=\dfrac{\sin(A+B)}{\cos(A+B)}$		
		$=\dfrac{\sin A\cos B+\cos A\sin B}{\cos A\cos B-\sin A\sin B}$	1	
		$=\dfrac{\dfrac{\sin A\cos B+\cos A\sin B}{\cos A\cos B}}{\dfrac{\cos A\cos B-\sin A\sin B}{\cos A\cos B}}$	1	
		$=\dfrac{\dfrac{\sin A\cos B}{\cos A\cos B}+\dfrac{\cos A\sin B}{\cos A\cos B}}{\dfrac{\cos A\cos B}{\cos A\cos B}-\dfrac{\sin A\sin B}{\cos A\cos B}}$	1	
		$=\dfrac{\tan A+\tan B}{1-\tan A\tan B}$	1	**4**
		---		
	c)	Prove that $\dfrac{\sin x\sin 2x+\sin 3x\sin 6x}{\sin x\cos 2x+\sin 3x\cos 6x}=\tan 5x$		
	Ans.	$\dfrac{\sin x\sin 2x+\sin 3x\sin 6x}{\sin x\cos 2x+\sin 3x\cos 6x}=-\dfrac{-2(\sin x\sin 2x+\sin 3x\sin 6x)}{-2(\sin x\cos 2x+\sin 3x\cos 6x)}$		
		$=-\dfrac{-2\sin x\sin 2x-2\sin 3x\sin 6x}{2\sin x\cos 2x+2\sin 3x\cos 6x}$		
		$=-\dfrac{\cos 3x-\cos(-x)+\cos 9x-\cos(-3x)}{\sin 3x+\sin(-x)+\sin 9x+\sin(-3x)}$	1	
		$=-\dfrac{\cos 3x-\cos x+\cos 9x-\cos 3x}{\sin 3x-\sin x+\sin 9x-\sin 3x}$		
		$=-\dfrac{\cos 9x-\cos x}{\sin 9x-\sin x}$	1	
		$=-\dfrac{-2\sin 5x\sin 4x}{2\cos 5x\sin 4x}$	1	**4**
		$=\tan 5x$	1	

Que. No.	Sub. Que.	Model Answers	Marks	Total Marks
5)	d)	Prove that $\sin 20^\circ \sin 40^\circ \sin 60^\circ \sin 80^\circ = \frac{3}{16}$		
	Ans.	$\sin 20^\circ \sin 40^\circ \sin 60^\circ \sin 80^\circ = \sin 20^\circ \sin 40^\circ \frac{\sqrt{3}}{2} \sin 80^\circ$	½	
		$= \frac{\sqrt{3}}{2} \cdot \frac{-1}{2}\left(-2\sin 20^\circ \sin 40^\circ\right)\sin 80^\circ$		
		$= -\frac{\sqrt{3}}{4}\left(\cos 60^\circ - \cos 20^\circ\right)\sin 80^\circ$	½	
		$= -\frac{\sqrt{3}}{4}\left(\frac{1}{2} - \cos 20^\circ\right)\sin 80^\circ$	½	
		$= -\frac{\sqrt{3}}{4}\left(\frac{1}{2}\sin 80^\circ - \sin 80^\circ \cos 20^\circ\right)$		
		$= -\frac{\sqrt{3}}{4}\left(\frac{1}{2}\sin 80^\circ - \frac{1}{2} \cdot 2\sin 80^\circ \cos 20^\circ\right)$		
		$= -\frac{\sqrt{3}}{4} \cdot \frac{1}{2}\left[\sin 80^\circ - \left(\sin 100^\circ + \sin 60^\circ\right)\right]$	½	
		$= -\frac{\sqrt{3}}{8}\left[\sin 80^\circ - \sin 100^\circ - \frac{\sqrt{3}}{2}\right]$	½	
		$= -\frac{\sqrt{3}}{8}\left[2\cos 90^\circ \sin 20^\circ - \frac{\sqrt{3}}{2}\right]$	½	
		$= -\frac{\sqrt{3}}{8}\left[0 - \frac{\sqrt{3}}{2}\right]$	½	
		$= \frac{3}{16}$	½	**4**
		Note: 1) If the above problem is proved, using the values of $\sin 20^\circ$, $\sin 40^\circ$, $\sin 80^\circ$ with the help of calculator, no marks to be given because under the constraint of the MSBTE Curriculum, it is expected that such problems are to be solved without using calculator.		
		Note 2) The above problem may also be solved by making various combinations of sine ratios. Consequently the solutions vary in accordance with the combinations. Please give the appropriate marks in accordance with the scheme of marking. For the sake of convenience one of the solutions is illustrated hereunder.		

Que. No.	Sub. Que.	Model Answers	Marks	Total Marks
5)		$\sin 20^o \sin 40^o \sin 60^o \sin 80^o = \sin 20^o \sin 40^o \frac{\sqrt{3}}{2} \sin 80^o$	½	
		$= \frac{\sqrt{3}}{2} \cdot \frac{-1}{2}\left(-2\sin 40^o \sin 80^o\right)\sin 20^o$		
		$= -\frac{\sqrt{3}}{4}\left(\cos 120^o - \cos 40^o\right)\sin 20^o$	½	
		$= -\frac{\sqrt{3}}{4}\left(\cos\left(90^o + 30^o\right) - \cos 40^o\right)\sin 20^o$		
		$= -\frac{\sqrt{3}}{4}\left(-\sin 30^o - \cos 40^o\right)\sin 20^o$	½	
		$= -\frac{\sqrt{3}}{4}\left(-\frac{1}{2} - \cos 40^o\right)\sin 20^o$	½	
		$= -\frac{\sqrt{3}}{4}\left(-\frac{1}{2}\sin 20^o - \sin 20^o \cos 40^o\right)$		
		$= -\frac{\sqrt{3}}{4}\left(-\frac{1}{2}\sin 20^o - \frac{1}{2}\cdot 2\sin 20^o \cos 40^o\right)$		
		$= \frac{\sqrt{3}}{4} \cdot \frac{1}{2}\left[\sin 20^o + \sin 60^o + \sin\left(-20^o\right)\right]$	½	
		$= \frac{\sqrt{3}}{8}\left[\sin 20^o + \frac{\sqrt{3}}{2} - \sin 20^o\right]$	½	
		$= \frac{\sqrt{3}}{8}\left[\frac{\sqrt{3}}{2}\right]$	½	
		$= \frac{3}{16}$	½	**4**
	e)	Prove that $\cos^{-1}\left(\frac{4}{5}\right) + \cos^{-1}\left(\frac{12}{13}\right) = \cos^{-1}\left(\frac{33}{65}\right)$		
	Ans.	$Let \quad A = \cos^{-1}\left(\frac{4}{5}\right)$ $B = \cos^{-1}\left(\frac{12}{13}\right)$		
		$\therefore \cos A = \frac{4}{5}$ $\cos B = \frac{12}{13}$		
		 		

Que. No.	Sub. Que.	Model Answers	Marks	Total Marks
5)		$\cos(A+B)=\cos A\cos B-\sin A\sin B$		
		$=\frac{4}{5}\times\frac{12}{13}-\frac{3}{5}\times\frac{5}{13}\quad ---(*)$	1	
		$=\frac{48}{65}-\frac{15}{65}$		
		$=\frac{48-15}{65}$		
		$=\frac{33}{65}\quad ---(**)$	1	
		$\therefore A+B=\cos^{-1}\left(\frac{33}{65}\right)$	1	
		$\therefore \cos^{-1}\left(\frac{4}{5}\right)+\cos^{-1}\left(\frac{12}{13}\right)=\cos^{-1}\left(\frac{33}{65}\right)$	1	**4**
		Note: Due to the use of advance scientific calculators which is permissible in the exam, students may write the step (**) directly after step (*). Writing such step are to be considered.		
		Note: To evaluate value of sin A and sin B, many times the relation between sine ratio and cosine ratio is used, instead of using Triangle Method as illustrated in the above solution. As the main object is to find the values, please consider these methods also. This is illustrated hereunder:		
		$\sin A=\sqrt{1-\cos^2 A}=\sqrt{1-\frac{16}{25}}=\frac{3}{5}$		
		$\sin B=\sqrt{1-\sin^2 B}=\sqrt{1-\frac{144}{169}}=\frac{5}{13}$		
		---		
	f)	Prove that $\tan^{-1}\left(\frac{1}{11}\right)+\cot^{-1}\left(\frac{6}{5}\right)=\sec^{-1}\sqrt{2}$		
	Ans.	$\tan^{-1}\left(\frac{1}{11}\right)+\cot^{-1}\left(\frac{6}{5}\right)=\tan^{-1}\left(\frac{1}{11}\right)+\tan^{-1}\left(\frac{5}{6}\right)$	1	
		$=\tan^{-1}\left(\frac{\frac{1}{11}+\frac{5}{6}}{1-\frac{1}{11}\cdot\frac{5}{6}}\right)$	1	

Que. No.	Sub. Que.	Model Answers	Marks	Total Marks
5)		$=\tan^{-1}\left(\frac{61}{61}\right)$		
		$=\tan^{-1}(1)$	1	
		$=\sec^{-1}\left(\sqrt{1+1^2}\right)$	1	**4**
		$=\sec^{-1}\sqrt{2}$		
		OR		
		$LHS=\tan^{-1}\left(\frac{1}{11}\right)+\cot^{-1}\left(\frac{6}{5}\right)$		
		$=\tan^{-1}\left(\frac{1}{11}\right)+\tan^{-1}\left(\frac{5}{6}\right)$	1	
		$=\tan^{-1}\left(\frac{\frac{1}{11}+\frac{5}{6}}{1-\frac{1}{11}\cdot\frac{5}{6}}\right)$	1	
		$=\tan^{-1}(1)$		
		$=\frac{\pi}{4}$ *or* 45^o	1	
		$RHS=\sec^{-1}\sqrt{2}=\frac{\pi}{4}$ *or* 45^o	1	**4**
		$\therefore LHS=RHS$		
		--		
6)		**Attempt any Four of the following.**		
	a)	If m_1 and m_2 are the slopes of two lines, prove that the acute angle between the lines is $\theta=\tan^{-1}\left\|\frac{m_1-m_2}{1+m_1\cdot m_2}\right\|$.		
	Ans.		1	
		Let θ_1 = Angle of inclination of L_1 θ_2 = Angle of inclination of L_2		

Que. No.	Sub. Que.	Model Answers	Marks	Total Marks
6)		$\therefore$ 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	
		$\therefore \tan\theta = \tan(\theta_1 - \theta_2)$ $= \frac{\tan(\theta_1) - \tan(\theta_2)}{1 + \tan(\theta_1)\tan(\theta_2)}$	1	
		$= \frac{m_1 - m_2}{1 + m_1 \cdot m_2}$	½	
		$\therefore \theta = \tan^{-1}\left(\frac{m_1 - m_2}{1 + m_1 \cdot m_2}\right)$	½	
		For angle to be acute, $\theta = \tan^{-1}\left\lvert\frac{m_1 - m_2}{1 + m_1 \cdot m_2}\right\rvert$	½	**4**
		---		
	b)	Show that the perpendicular distance of a point $(x_1,\ y_1)$ from the line $ax + by + c = 0$ is $\left\lvert\frac{ax_1 + by_1 + c}{\sqrt{a^2 + b^2}}\right\rvert$		
	Ans.			
		Area of $\Delta PAB = \frac{1}{2}\begin{vmatrix} x_1 & y_1 & 1 \\ -\frac{c}{a} & 0 & 1 \\ 0 & -\frac{c}{b} & 1 \end{vmatrix}$		
		$= \frac{c}{2ab}(ax_1 + by_1 + c)$	1	
		Now $AB = \sqrt{\left(-\frac{c}{a} - 0\right)^2 + \left(0 + \frac{c}{b}\right)^2} = \frac{c\sqrt{a^2 + b^2}}{ab}$	½	

Que. No.	Sub. Que.	Model Answers	Marks	Total Marks
6)		$But\ \ Area\ \ of\ \Delta PAB = \frac{1}{2}\times AB\times PM$		
		$= \frac{1}{2}\times\frac{c\sqrt{a^2+b^2}}{ab}\times p$	1	
		$\therefore \frac{1}{2}\times\frac{c\sqrt{a^2+b^2}}{ab}\times p = \frac{c}{2ab}\left(ax_1+by_1+c\right)$	½	
		$\therefore\ p = \frac{ax_1+by_1+c}{\sqrt{a^2+b^2}}$	½	
		$As\ length\ is\ always\ +ve,$		
		$p = \left\lvert\frac{ax_1+by_1+c}{\sqrt{a^2+b^2}}\right\rvert$	½	**4**
		---		
	c)	Find the equation of the line passing through the point (-3, 10) and the sum of whose x and y intercepts is 8.		
	Ans.	Let $x-\text{int}=a$ and $y-\text{int}=b$		
		$\therefore a+b=8$	½	
		$\therefore b=8-a$		
		$\therefore the\ equation\ is$		
		$\frac{x}{a}+\frac{y}{8-a}=1$		
		$\therefore (8-a)x+ay=a(8-a)$	½	
		$But\ (-3,\ 10)\ is\ on\ the\ line.$		
		$\therefore -3(8-a)+10a=a(8-a)$	1	
		$\therefore -24+3a+10a=8a-a^2$		
		$\therefore a^2+5a-24=0$		
		$\therefore a=3,\ -8$	1	
		$\therefore \boxed{\frac{x}{3}+\frac{y}{5}=1}\quad or\quad \boxed{\frac{x}{-8}+\frac{y}{16}=1}$	1	**4**
		---		
	d)	Find the equation of line passing through the point of intersection of the lines $3x+y-10=0$ and $x+7y+40=0$ and perpendicular to the line $3x=4y$.		

Que. No.	Sub. Que.	Model Answers	Marks	Total Marks
6)	Ans.	$3x+y=10$ $x+7y=-40$ $\therefore 21x+7y=70$ $x+7y=-40$ $-\quad -\quad +$ $20x=110$ $\therefore x=\frac{11}{2}$ $\therefore y=-\frac{13}{2}$ $\therefore$ the point of intersection is $\left(\frac{11}{2},\ -\frac{13}{2}\right)$ *For the line* $3x=4y$, *the slope is* $m_0=\frac{3}{4}$ $\therefore$ the required slope is $m=-\frac{4}{3}$ $\therefore$ the equation is $y-y_1=m\left(x-x_1\right)$ $\therefore y+\frac{13}{2}=-\frac{4}{3}\left(x-\frac{11}{2}\right)$ $\therefore 6y+13=-8x+44$ $\therefore 8x+6y-31=0 \quad or \quad -8x-6y+31=0$	 ½ ½ ½ ½ ½ ½ 1	 **4**
		--		
	e)	Find the distance between parallel lines $3x+4y+5=0$ and $6x+8y=25$.		
	Ans.	*Given* $3x+4y+5=0$ *and* $6x+8y=25$ $\therefore 6x+8y+10=0$ *and* $6x+8y-25=0$ $\therefore A=6,\ B=8,\ C_1=10$ *and* $C_2=-25$ $\therefore p=\left\|\frac{C_1-C_2}{\sqrt{A^2+B^2}}\right\| \quad or \quad \left\|\frac{C_2-C_1}{\sqrt{A^2+B^2}}\right\|$ $=\left\|\frac{10+25}{\sqrt{6^2+8^2}}\right\| \quad or \quad \left\|\frac{-25-10}{\sqrt{6^2+8^2}}\right\|$ $=\frac{7}{2} \quad or \quad 3.5$ **OR**	 1 1 2	 **4**

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<tr><td>6)</td><td></td><td>

OR

Given $3x+4y+5=0$ *and* $6x+8y=25$

$\therefore 3x+4y+5=0$ *and* $3x+4y-\frac{25}{2}=0$

$\therefore A=3,\ B=4,\ C_1=5$ *and* $C_2=-\frac{25}{2}$

$\therefore p=\left|\frac{C_1-C_2}{\sqrt{A^2+B^2}}\right|$ *or* $\left|\frac{C_2-C_1}{\sqrt{A^2+B^2}}\right|$

$=\left|\frac{5+\frac{25}{2}}{\sqrt{3^2+4^2}}\right|$ *or* $\left|\frac{-\frac{25}{2}-5}{\sqrt{3^2+4^2}}\right|$

$=\frac{7}{2}$ *or* 3.5

Note: If the –ve value is left with answer, deduct 1 mark.

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<tr><td></td><td>f)</td><td>

For what value of 'k' the lines $x-ky=14$ and $4x+(k-3)y+3=0$ are perpendicular to each other.

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<tr><td></td><td>Ans.</td><td>

For the line $x-ky-14=0$,

slope $m_1=-\frac{A}{B}=-\frac{1}{-k}=\frac{1}{k}$

For the line $4x+(k-3)y+3=0$,

slope $m_2=-\frac{A}{B}=-\frac{4}{k-3}$

But $m_1\cdot m_2=-1$

$\therefore \frac{1}{k}\cdot\left(-\frac{4}{k-3}\right)=-1$

$\therefore 4=k(k-3)$

$\therefore k^2-3k-4=0$

$\therefore k=-1,\ 4$

OR

For the line $x-ky-14=0$,

slope $m_1=-\frac{A}{B}=-\frac{1}{-k}=\frac{1}{k}$

For the line $4x+(k-3)y+3=0$,

slope $m_2=-\frac{A}{B}=-\frac{4}{k-3}$

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Que. No.	Sub. Que.	Model Answers	Marks	Total Marks
6)		$But\ \ m_1 = -\dfrac{1}{m_2}$		
		$\therefore \dfrac{1}{k} = -\dfrac{1}{-\dfrac{4}{k-3}}$	1	
		$\therefore \dfrac{1}{k} = \dfrac{k-3}{4}$		
		$\therefore 4 = k\left(k-3\right)$		
		$\therefore k^2 - 3k - 4 = 0$		
		$\therefore k = -1,\ \ 4$	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.		

