MATHEMATICS HSSC–I

Time allowed: 2:35 Hours **Total Marks Sections B and C: 80**

SECTION – B (Marks 48)

Q. 2 Solve the following Questions. **(12 x 4 = 48)**

(i)	Simplify $z=\frac{(3+i)^3}{3-i}$ in the form $a+ib$ where $i=\sqrt{-1}$ and find the value of $\lvert z\rvert$.	**04**	**OR**	Find row rank of $\begin{bmatrix}1&2&3&2\\4&2&1&3\\5&2&-1&2\end{bmatrix}$	**04**
(ii)	Solve the system of linear equations. $(3-2i)x+(1+2i)y-1=0$ $(3+2i)x-(1-2i)y-1=0$	**04**	**OR**	If 4th and 10th terms of a HP are $\frac{2}{15}$ and $\frac{2}{33}$ respectively, then find its 23rd term.	**04**
(iii)	If $A=\begin{bmatrix}5&9&2\\4&8&1\\3&7&0\end{bmatrix}$, then show that $(A+A^t)$ is symmetric.	**04**	**OR**	For what value of p, vectors $3p\underline{i}+11\underline{j}-5\underline{k}$ and $2p\underline{i}+p\underline{j}+2\underline{k}$ are mutually perpendicular?	**04**
(iv)	Find the volume of a tetrahedron with vertices $A(1,2,2), B(2,1,1), C(3,3,4)$ and $D(0,1,5)$	**04**	**OR**	Insert four A.Ms between 5 and 25.	**04**
(v)	If 2nd and 6th terms of a GP are 3 and $\frac{3}{4}$ respectively, find its 16th term.	**04**	**OR**	Sum to n-terms the series $1.5+2.6+3.7+4.8+.....$	**04**
(vi)	How many 7-digit different numbers can be formed from the digits $5,5,6,6,9,9,9$ using all and how many of them are greater than $9,950,000$?	**04**	**OR**	Prove that $1+4+7+....+(3n-2)=\frac{n(3n-1)}{2}$ by using the mathematical induction.	**04**
(vii)	For a real valued function $f(x)=\frac{5x-2}{x+2}, x\neq -2$ find $f^{-1}(x)$ and determine its domain and range.	**04**	**OR**	If $\text{Cos}\alpha=\frac{3}{5}$, $\text{Sin}\beta=\frac{5}{13}$ with $\frac{\pi}{2}<\beta<\pi$ and $\frac{3\pi}{2}<\alpha<2\pi$, then find the value of $\text{Sin}(\alpha+\beta)$	**04**
(viii)	State number of diagonals of an n-sided polygon and find number of diagonals of a nine sided polygon.	**04**	**OR**	Prove that $\text{Sin}2\theta+\text{Sin}4\theta+\text{Sin}6\theta+\text{Sin}8\theta=4\text{Sin}5\theta\,\text{Cos}2\theta\,\text{Cos}\theta$	**04**
(ix)	Find the equation of a parabola $y=ax^2+bx+c$ that cuts x-axis at points $(-4,0),(4,0)$ and passes through a point $(0,8)$.	**04**	**OR**	A pair of fair dice is thrown. The number of dots on the top are added. What is the probability of getting a sum greater than 9 or a sum divisible by 5.	**04**
(x)	Verify that $\text{Cos}^4\theta=\frac{1}{8}(3+2\text{Cos}2\theta+\text{Cos}4\theta)$	**04**	**OR**	Solve triangle ABC with $\alpha=31°5',\ \beta=50°55'$ and $C=13cm$ using usual notations.	**04**
(xi)	Find radii of the escribed circles of triangle ABC opposite to the largest and smallest sides given that $a=13, b=10$ and $c=7$ (using usual notations)	**04**	**OR**	Without drawing, guess the graph of $y=\text{Sin}\frac{\theta}{6}$ and find its period, frequency and amplitude.	**04**
(xii)	Verify that $2S=8R\,\text{Cos}\frac{\alpha}{2}\text{Sin}\frac{\beta}{2}\text{Cos}\frac{\gamma}{2}$	**04**	**OR**	Verify that $\text{Tan}^{-1}\frac{3}{4}-\text{Tan}^{-1}\frac{4}{3}+2\text{Tan}^{-1}\frac{1}{7}=0$	**04**

SECTION – C (Marks 32)

Note: Solve the following Questions. **(4 x 8 = 32)**

(Use of graph paper is not necessary. Candidates can make their own grid on answer book)

Q.3	Find inverse of the matrix $\begin{bmatrix}1&1&2\\3&-1&1\\-1&3&4\end{bmatrix}$	**08**	**OR**	If $\underline{a}=-10\underline{i}+2\underline{j}+4\underline{k}$ and $\underline{b}=\underline{i}-\underline{j}+2\underline{k}$ then find a unit vector orthogonal to $\underline{a}\times\underline{b}$. Also find angle between the vectors $\underline{a}$ and $\underline{b}$.	**08**
Q.4	Use Gauss Jordan method to solve the system of linear equations: $x-2y+z=3;\quad 3x+5y=11;\quad 4y+3z=13$	**08**	**OR**	If $y=\frac{1}{2(1!)}\left(\frac{1}{6}\right)+\frac{1.3}{4(2!)}\left(\frac{1}{6}\right)^2+\frac{1.3.5}{8(3!)}\left(\frac{1}{6}\right)^3+....$ then verify that $5y^2+10y-1=0$	**08**
Q.5	Find point of intersection of the functions $f(x)=-x+6$ and $g(x)=x^2-4x+6$ graphically.	**08**	**OR**	Find general solution of a trigonometric equation $3\text{Cos}x+3=2\text{Sin}^2x$	**08**
Q.6	Find maximum and minimum values of a function $f(x,y)=2x+3y$ subject to the constraints $x+2y\leq 10,\quad 3x+y\leq 9,\quad 9x+8y\leq 72,\quad x\geq 0,\ y\geq 0$	**08**	**OR**	Sketch the graph of $y=2\text{Cos}\frac{\theta}{2};\quad -\pi\leq\theta\leq\pi$	**08**

MATHEMATICS HSSC–I

Time allowed: 2:35 Hours **Total Marks Sections B and C: 80**

SECTION – B (Marks 48)

Q. 2 Solve the following Questions. **(12 x 4 = 48)**

(i)	Simplify $z=\frac{(4-6i)(2+i)}{(3+i)(1+i)}$ in the form $a+ib$ where $i=\sqrt{-1}$ and find the value of $\lvert z\rvert$.	**04**	**OR**	Find the value of x, if $\begin{bmatrix} x+1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & x+9 \end{bmatrix}$ is a singular matrix.	**04**
(ii)	Solve the system of linear equations. $(2+3i)x+(1-i)y-11=0$ $(1+i)x+(2-3i)y-11=0$	**04**	**OR**	A particle acted by constant force $2\underline{i}+\underline{j}, \underline{i}+2\underline{j}, \underline{i}+\underline{j}+\underline{k}$ and $3\underline{i}-2\underline{j}+4\underline{k}$ is displaced from point $P(0,-2,-3)$ to point $Q(2,0,6)$. Find the work done.	**04**
(iii)	If $A=\begin{bmatrix} 7 & 8 & 6 \\ 6 & 7 & 5 \\ 5 & 6 & 4 \end{bmatrix}$, then show that $(A-A^t)$ is skew-symmetric.	**04**	**OR**	Find number of different arrangements that can be made from the letters of word PARALELLOGRAM (using all) and how many of these begin with PE and end with OM?	**04**
(iv)	Insert four G.Ms between 7 and 1701	**04**	**OR**	Find the volume of a parallelepiped with adjacent edges defined by vertices. $A(0,1,2), B(1,2,1), C(5,5,6)$ and $D(3,3,1)$	**04**
(v)	The 11th and 19th terms of an AP are 42 and 74 respectively. Find the sum of first 20 terms of AP.	**04**	**OR**	Sum to n-terms the series $1.2+2.3+3.4+.....$	**04**
(vi)	Verify that $3+7+11+.....+(4n-1)=n(2n+1)$ by using the mathematical induction.	**04**	**OR**	Find the values of $'n'$ and $'r'$ if ${}^{n}P_{r}=15120$ and ${}^{n}C_{r}=126$	**04**
(vii)	In an HP, 8th term is $\frac{2}{5}$ and 17th term is $\frac{2}{11}$. Find 35th term of the HP.	**04**	**OR**	For a real valued function $f(x)=\frac{3x-2}{x+4}$, find $f^{-1}(x)$ and determine its domain and range.	**04**
(viii)	In a single throw of two fair dice, the number of dots on the top are added. Find the probability of getting a sum of 7 or 9.	**04**	**OR**	Without drawing, guess the graph of $y=\text{Cos}\frac{1}{6}\theta$. Also find its period, frequency and amplitude.	**04**
(ix)	If $\text{Sec}\alpha=\frac{5}{4}, \text{Sec}\beta=\frac{13}{5}$ with $\frac{3\pi}{2}<\alpha<2\pi$ and $\frac{3\pi}{2}<\beta<2\pi$, then find the value of $\tan(\alpha+\beta)$.	**04**	**OR**	Solve triangle ABC with $a=15, c=20$ and $\beta=60°$ using usual notations.	**04**
(x)	Verify that $\text{Cos}3\theta+\text{Cos}5\theta+\text{Cos}7\theta+\text{Cos}9\theta=4\text{Cos}\theta\,\text{Cos}2\theta\,\text{Cos}6\theta$	**04**	**OR**	Find radii ('R' and 'r') of circumscribed and inscribed circles of triangle ABC with side measures $a=4cm, b=7cm$ and $c=9cm$ (use usual notations).	**04**
(xi)	Verify that $2r=8R\,\text{Sin}\frac{\alpha}{2}\text{Sin}\frac{\beta}{2}\text{Sin}\frac{\gamma}{2}$ (use usual notations).	**04**	**OR**	Verify $\text{Sin}^4\theta=\frac{1}{8}(3+\text{Cos}4\theta-4\text{Cos}2\theta)$	**04**
(xii)	Verify that $\left(\text{Sin}^{-1}\frac{1}{\sqrt{5}}+\text{Sin}^{-1}\frac{1}{\sqrt{10}}\right)+\left(\text{Cos}^{-1}\frac{2}{\sqrt{5}}+\text{Cos}^{-1}\frac{3}{\sqrt{10}}\right)=\frac{\pi}{2}$	**04**	**OR**	Find equation of a parabola $y=ax^2+bx+c\ (\forall a,b,c\in R)$ that cuts *x*-axis at points $(-5,0),(4,0)$ and passes through a point $(1,18)$	**04**

SECTION – C (Marks 32)

Note: Solve the following Questions. **(4 x 8 = 32)**

(Use of graph paper is not necessary. Candidates can make their own grid on answer book)

Q.3	Find inverse of the matrix $\begin{bmatrix} 1 & 1 & 2 \\ 3 & -1 & 1 \\ -1 & 3 & 4 \end{bmatrix}$	**08**	**OR**	Find a vector of magnitude 14 units orthogonal to vectors $\underline{a}=-\underline{i}+3\underline{j}$ and $\underline{b}=\underline{i}+2\underline{k}$ both. Also find angle between the vectors $\underline{a}$ and $\underline{b}$.	**08**
Q.4	Use Gauss Jordan method to solve the system of linear equations. $-x+y+2z=2; \quad 3x-y+z=6; \quad -x+3y+4z=4$	**08**	**OR**	Find the point of intersection graphically from the following functions. $f(x)=-x+4; \quad g(x)=x^2-3x+1$	**08**
Q.5	If $y=\frac{1}{(1!)2}\left(\frac{1}{4}\right)+\frac{1.3}{(2!)4}\cdot\left(\frac{1}{4}\right)^2+\frac{1.3.5}{(3!)8}\left(\frac{1}{4}\right)^3+.....$, then prove that $3y^2+6y-1=0$	**08**	**OR**	Find general solution of a trigonometric equation $\text{Cos}2x=\text{Sin}x$	**08**
Q.6	Find maximum and minimum values of a function $f(x,y)=3x+2y$ subject to the constraints $x+2y\le 8, \quad 5x-2y\le 10, \quad 7x-5y\ge -35, \quad x\ge 0, \quad y\ge 0$	**08**	**OR**	Sketch the graph of $y=\text{Sin}\frac{\theta}{2}; \quad -\pi\le\theta\le\pi$	**08**