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Version No.				
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ROLL NUMBER						

MATHEMATICS HSSC-I

SECTION – A (Marks 20)

Time allowed: 25 Minutes

Section – A is compulsory. All parts of this section are to be answered on this page and handed over to the Centre Superintendent. Deleting/overwriting is not allowed.

Do not use lead pencil.

حصہ اوّل لازمی ہے۔ اس کے جوابات اسی صفحہ پر دیے کر ناظم مرکز کے حوالے کریں۔ کاٹ کر دوبارہ لکھنے کی اجازت نہیں ہے۔ لیڈ پنسل کا استعمال ممنوع ہے۔

Answer Sheet No. _____

ہر سوال کے سامنے دیے گئے، کریکولم کے مطابق درست دائرہ کو پُر کریں۔ **Invigilator Sign.** _____

Fill the relevant bubble against each question according to curriculum: **Candidate Sign.** _____

	Question	A	B	C	D	A	B	C	D
1.	What are the multiplicative factors of z^2+4z+5?	$(z+2-i)$ $(z+2+i)$	$(z-2-i)$ $(z-2+i)$	$(z+2-2i)$ $(z+2+2i)$	$(z-2-2i)$ $(z-2+2i)$	○	○	○	○
2.	The principal argument (θ) of the complex number $z=-1+i\sqrt{3}$ is:	$-\frac{\pi}{3}$	$\frac{\pi}{3}$	$\frac{2\pi}{3}$	$\frac{5\pi}{3}$	○	○	○	○
3.	A system of linear equations is said to be inconsistent if it has:	No solution	At least one solution	Infinitely many solutions	Exactly two solutions	○	○	○	○
4.	If A is a 3 x 3 matrix, then $\lvert 3A\rvert$ results	$3\lvert A\rvert$	$6\lvert A\rvert$	$9\lvert A\rvert$	$27\lvert A\rvert$	○	○	○	○
5.	In an arithmetic sequence, $a_1=5$ and $a_{15}=75$. What is the common difference?	3	4	5	6	○	○	○	○
6.	If $\frac{1}{2}, \frac{1}{x}, \frac{1}{5}$ are in harmonic sequence then what is the value of x?	$\frac{2}{7}$	$\frac{7}{2}$	$\frac{7}{10}$	$\frac{10}{7}$	○	○	○	○
7.	What is the first term of an infinite geometric series whose sum is 10, and common ratio 0.6?	4	5	6	7	○	○	○	○
8.	What is the sum of the series up to 4 terms? $1+3+5+\cdots+(2n-1)=n^2 \quad \forall n\in N$	7	9	15	16	○	○	○	○
9.	What is the middle term in the expansion of $(x+y)^6$?	$\binom{6}{2}x^3y^3$	$\binom{6}{3}x^3y^3$	$\binom{6}{3}x^4y^2$	$\binom{6}{2}x^4y^2$	○	○	○	○
10.	In signal processing, $P(x)$ represents a signal. If $P(-1)=0$, then the signal has:	A zero at $x=-1$	Unstablity	Periodicity	Error	○	○	○	○
11.	If dot product of two vectors is zero then angle between them is:	180°	90°	45°	0°	○	○	○	○

	Question	A	B	C	D	A	B	C	D
12.	If $\vec{a}.\vec{b}\times\vec{c}=12$ then volume of parallelepiped with $\vec{a}$, $\vec{b}$ and $\vec{c}$ as co–terminal edges is:	6	12	24	36	○	○	○	○
13.	A force $\vec{F}=2\hat{i}+\hat{j}+3\hat{k}$ moves an object along a displacement vector $\vec{d}=3\hat{i}+4\hat{j}-2\hat{k}$. What is the work done?	–4	10	4	16	○	○	○	○
14.	If $\tan\theta=2$, what is the value of $\mathrm{Cos}\,\theta$ when θ is in the first quadrant?	$\frac{1}{\sqrt{3}}$	$\frac{2}{\sqrt{5}}$	$\sqrt{5}$	$\frac{1}{\sqrt{5}}$	○	○	○	○
15.	If $sinx=\frac{3}{5}$, what is the value of $sin2x$? $(0°<x<90°)$	$\frac{12}{25}$	$\frac{24}{25}$	$\frac{7}{25}$	$\frac{25}{25}$	○	○	○	○
16.	If graph of a function is symmetric about origin (e.g. $\mathrm{Sin}\,x$), what type of function is it?	Even	Odd	Neither Even nor Odd	Periodic but not Symmetric	○	○	○	○
17.	The range of a trigonometric function $4sin4x$ is:	$[-1, 1]$	$[-4, 4]$	$[-16, 16]$	$(-\infty,+\infty)$	○	○	○	○
18.	The expression $sin75^{\circ}cos15^{\circ}$ is equivalent to:	$\frac{1}{2}(\sin90^{\circ}+\sin60^{\circ})$	$\frac{1}{2}(\cos90^{\circ}+\cos60^{\circ})$	$\frac{1}{2}(\sin60^{\circ}-\sin90^{\circ})$	$\frac{1}{2}(\cos60^{\circ}-\cos90^{\circ})$	○	○	○	○
19.	How many 5-letter words can be formed from the word 'MATHS' without repeating any letter?	20	60	120	240	○	○	○	○
20.	In how many different ways a player can select 6 numbers from a set of 49 numbers, in a lottery?	${}^{49}C_6$	$\frac{49!}{6!}$	${}^{49}P_6$	$6!$	○	○	○	○

$$S_{\infty}=\frac{a_1}{1-r}$$

ROLL NUMBER						

MATHEMATICS HSSC–I

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

SECTION – B (Marks 48)

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

(i)	Solve the quadratic equation $3z^2+2z+2=0,\ z\in C$ by completing the square method.	04	OR	A triangular park has its three corners located at points **A (2, 3, 1)**, **B (5, 7, 2)**, and **C (1, 4, 3)**. Find area of the park using cross product of vectors.	04
(ii)	Verify that:. $sin\theta\cdot sin\left(\frac{\pi}{3}-\theta\right)\cdot sin\left(\frac{\pi}{3}+\theta\right)=\frac{1}{4}sin3\theta$	04	OR	Verify that: $\binom{n}{r}+\binom{n}{r-1}=\binom{n+1}{r}$	04
(iii)	Find the value of p such that vectors $\hat{i}+2\hat{j}+p\hat{k}$, $3\hat{i}+p\hat{j}+4\hat{k}$ and $2\hat{i}+3\hat{j}+4\hat{k}$ are coplanar.	04	OR	Find the maximum and minimum values of the function $f(\theta)=\frac{1}{3+5\cos(2\theta+\pi)}$	04
(iv)	If $P(x)=x^4-6x^3+11x^2-6x$, then (a) Divide $P(x)$ by $(x-1)$ using synthetic division (b) Solve the resulting depressed equation.	04	OR	A harmonic sequence has 2nd term $\frac{1}{6}$ and 4th term $\frac{1}{12}$ Find general term of the sequence.	04
(v)	Without drawing graph find range, amplitude, period and frequency of the function $y=-4cos(7x-\pi)$	04	OR	Find the term containing x^3 in the expansion of $(x+2)^6$.	04
(vi)	In an arithmetic sequence, the 5th term is 15, and the 12th term is 50. Find a) Common difference and b) First term of the sequence.	04	OR	Verify that: $\frac{1+sin2\theta+cos2\theta}{1+sin2\theta-cos2\theta}=cot\theta$	04
(vii)	Verify that $\begin{vmatrix}1 & a & a^2\\ 1 & b & b^2\\ 1 & c & c^2\end{vmatrix}=(b-a)(c-a)(c-b)$	04	OR	If $tan\theta=\frac{3}{4}$ with $\pi<\theta<\frac{3\pi}{2}$, find the exact values of (a) $sin\left(\frac{\theta}{2}\right)$ and (b) $cos\left(\frac{\theta}{2}\right)$ without using calculator.	04
(viii)	A bouncing ball rebounds 80% of its previous height. If the ball is dropped from a height of 50 meters. Find the total distance traveled by the ball before coming to rest.	04	OR	How many words can be formed by using the letters from the word "EDUCATION" such that all the vowels are never together?	04
(ix)	Use the principle of mathematical induction to prove that $1^3+2^3+3^3+\ldots+n^3=\left(\frac{n(n+1)}{2}\right)^2\ \forall n\in N,\ n\geq 1$.	04	OR	Find rank of the matrix $\begin{bmatrix}1 & 1 & 0 & -2\\ 2 & 0 & 2 & 2\\ 4 & 1 & 3 & 1\end{bmatrix}$	04
(x)	If $z_1=10(\cos100^\circ+i\sin100^\circ)$ and $z_2=5(\cos40^\circ+i\sin40^\circ)$, then find the following in polar form: (a) $z_1\cdot z_2$, (b) $\frac{z_1}{z_2}$.	04	OR	A solar panel's sunlight reception is modeled as $P(\theta)=100\ cos(3\theta-90^\circ)$, with $0^\circ\leq\theta\leq180^\circ$ (a) Find angle for the maximum sunlight and the max sunlight received. (b) Find angle for the minimum sunlight and the min sunlight received.	04
(xi)	A force $\vec{F}=6\hat{i}+8\hat{j}+4\hat{k}$ acts on an object. The object moves from A (1,2,3) to point B(4,6,5). (a) Find the displacement vector $\vec{d}$. (b) Calculate work done by the force $\vec{F}$.	04	OR	If $P(x)=ax^3+bx^2+2x-1$, leaves remainder 5 when divided by $(x-1)$ and leaves remainder 3 when divided by $(x+1)$. Find values of a and b using remainder theorem.	04
(xii)	Solve $x+y+z=3;\ y+z=2;\ z=2$ using Cramer's rule:	04	OR	Use binomial theorem to approximate the value of $\sqrt{101}\times\sqrt{99}$ up to three places of decimal.	04

SECTION – C (Marks 32)

Note: Solve the following Questions. **(4 x 8 = 32)**
(Use of the graph paper is not necessary. Candidates can makes their own grid on answer book)

Q.3	If $P(x)=2x^3+x^2-13x+6$, then **a)** Verify that $(x+3)$ is a factor of $P(x)$. **b)** Factorize $P(x)$ using synthetic division. **c)** Find all the roots of $P(x)$. **d)** Write complete factorized form of $P(x)$ and confirm by expanding.	08	OR	If $\vec{a}=3\hat{i}-2\hat{j}+4\hat{k}$ and $\vec{b}=\hat{i}+2\hat{j}-\hat{k}$, then (a) Find $\vec{a}\times\vec{b}$. (b) Find $(\vec{a}\times\vec{b})\cdot\vec{a}$ and verify that $\vec{a}\times\vec{b}\perp\vec{a}$. (c) Find $(\vec{a}\times\vec{b})\cdot\vec{b}$ and verify that $\vec{a}\times\vec{b}\perp\vec{b}$	08
Q.4	If x is very small such that its square and higher powers can be neglected, then show that : $\frac{(16+4x)^{\frac{3}{4}}}{(4+x)\sqrt{9-6x}}\approx\frac{2}{3}+\frac{13x}{72}$	08	OR	Verify the fundamental law of trigonometry: $\cos(\alpha-\beta)=\cos\alpha\cos\beta+\sin\alpha\sin\beta$ Where α,β are real angles in standard position and $\alpha>\beta$.	08
Q.5	Solve $x+2y-3z=4$, $2x-3y+4z=5$, $3x+4y-5z=6$ using the Gaussian elimination method.	08	OR	$y=3cos2x\ ;-\frac{\pi}{2}\leq x\leq\frac{\pi}{2}$ **a)** Make table of values for given interval **b)** Draw the graph of the function for given interval	08
Q.6	For an arithmetic-geometric series: $1+5\left(\frac{1}{2}\right)^1+9\left(\frac{1}{2}\right)^2+13\left(\frac{1}{2}\right)^3+\ldots$ (a) Find general term of the series. (b) Sum the series upto n terms, (c) Sum the series upto infinite terms.	08	OR	A company has 7 engineers and 5 managers. In how many ways can a project team of 5 be selected if it includes: (a) 3 engineers and 2 managers? (b) 4 engineers and 1 manager? (c) At least 4 engineers? (d) At the most 1 manager?	08