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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 کرنا ظم 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 پر 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+9 ?	$(z+3i)(z-3i)$	$(z-3)(z+3)$	$(z+3)^2$	$(z-3i)^2$	○	○	○	○
2.	The rectangular form of $4\left(\cos\frac{2\pi}{3}+i\sin\frac{2\pi}{3}\right)$ is:	$-2+2i\sqrt{3}$	$-2-2i\sqrt{3}$	$2+2i\sqrt{3}$	$2-2i\sqrt{3}$	○	○	○	○
3.	A system of linear equations is said to be inconsistent if it has:	No solution	At least one solution	Exactly one solution	Exactly two solution	○	○	○	○
4.	If $\begin{vmatrix} a & b & c \\ d & e & f \\ g & h & i \end{vmatrix}=5$, then $\begin{vmatrix} 2a & 2b & 2c \\ 3d & 3e & 3f \\ g & h & i \end{vmatrix}=$	6	10	15	30	○	○	○	○
5.	In an arithmetic series, if $a=2$, $d=4$ then $S_{15}=$	240	450	480	510	○	○	○	○
6.	What is the sum of first two terms of an arithmetic-geometric sequence $T_n=(2n+1)\cdot 3^{n-1}$? $(n\in N)$	5	11	18	23	○	○	○	○
7.	For what value of x geometric series $1+2x+4x^2+8x^3+\ldots$ converges? $(r<1)$	$\frac{1}{2}$	$\frac{1}{4}$	1	$\frac{2}{1}$	○	○	○	○
8.	The number of ways to climb a 10-step staircase (taking either 1 or 2 steps at a time) is 89. Which method justifies the best conclusion?	Empirical counting	Pascal's Triangle	Mathematical Induction	Binomial Theorem	○	○	○	○
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.	The division of $2x^3-5x^2+3x-1$ by $(x-2)$ gives remainder:	–3	0	5	1	○	○	○	○
11.	If dot product of two vectors is zero then angle between them is:	180°	90°	45°	0°	○	○	○	○
12.	If $\vec{a}\perp\vec{b}$, then projection of $\vec{a}$ on $\vec{b}$ is:	–1	0	1	Undefined	○	○	○	○

	Question	A	B	C	D	A	B	C	D
13.	What is the volume of a parallelepiped formed by vectors $\hat{i}+\hat{j}$, $\hat{j}+\hat{k}$ and $\hat{k}+\hat{i}$?	0	1	$\sqrt{2}$	2	○	○	○	○
14.	$sin75^{\circ}cos15^{\circ} =$	$\frac{1}{2}(sin90^{\circ}+sin60^{\circ})$	$\frac{1}{2}(\cos 90^{\circ}+\cos 60^{\circ})$	$\frac{1}{2}(\sin 60^{\circ}-\sin 90^{\circ})$	$\frac{1}{2}(\cos 60^{\circ}-\cos 90^{\circ})$	○	○	○	○
15.	What is value of $cos\left(\frac{\theta}{2}\right)$, if $cos\theta=\frac{1}{2}$; $(0<\theta<90°)$	$\frac{\sqrt{3}}{2}$	$\frac{1}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{1}{2\sqrt{2}}$	○	○	○	○
16.	Which of the following is an odd function?	$f(x)=cosx$	$f(x)=sinx+cosx$	$f(x)=tanx$	$f(x)=secx$	○	○	○	○
17.	The range of $f(x)=3cosx+4$ is:	$[-1, 1]$	$[1, 7]$	$[-3, 3]$	$[4, 7]$	○	○	○	○
18.	Which function's graph is symmetric about y-axis?	$y=sinx$	$y=tanx$	$y=cosx$	$y=cscx$	○	○	○	○
19.	A cell phone password consists of 4 distinct digits (0-9). How many possible passwords can be set?	${}^{10}C_4$	${}^{10}P_4$	${}^{9}C_4$	${}^{9}P_4$	○	○	○	○
20.	How many 5-letter words can be formed from the word 'TABLE' without repeating any letter?	20	60	120	240	○	○	○	○

$$S_n=\frac{n}{2}[2a+(n-1)d]$$

ROLL NUMBER						

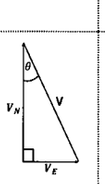
MATHEMATICS HSSC–I

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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)	Express the following in rectangular form. **a)** $\left[5\left(cos45^\circ + i\,sin45^\circ\right)\right]\left[4\left(cos15^\circ + i\,sin15^\circ\right)\right]$ **b)** $\dfrac{\left[27\left(cos120^\circ + i\,sin120^\circ\right)\right]}{\left[3\left(cos60^\circ + i\,sin60^\circ\right)\right]}$	**04**	**OR**	A mechanic applies a force $\vec{F} = 3\hat{i} + 4\hat{j} + 5\hat{k}$ at point $A\,(14,-3,\,6)$ to turn a bolt with pivot at $P\,(2,-2,1)$. Find: **(a)** the moment arm $\vec{r}$ and **(b)** the moment vector $\vec{M}$ about the bolt.	**04**
(ii)	Verify that: $cos\theta \,.\, cos\left(\frac{\pi}{3}-\theta\right) . cos\left(\frac{\pi}{3}+\theta\right) = \frac{1}{4}cos3\theta$	**04**	**OR**	Verify that: ${}^{n}P_r = {}^{n-1}P_r + r.{}^{n-1}P_{r-1}$	**04**
(iii)	Find the value of λ such that vectors $\hat{i}+4\hat{j}+2\hat{k}$, $2\hat{i}-\hat{j}+3\hat{k}$ and $\lambda\hat{i}+3\hat{j}+5\hat{k}$ are coplanar.	**04**	**OR**	Find the maximum and minimum values of the function: $f(\theta) = \dfrac{1}{3+4sin(5\theta+\pi)}$	**04**
(iv)	If $P(x) = 3x^3 - 5x^2 - 16x + 12$, then **(a)** Use factor theorem to verify that $(x+2)$ is a factor of $P(x)$. **(b)** Apply synthetic division to factorize $P(x)$ completely.	**04**	**OR**	A harmonic sequence has 3rd term $\frac{1}{8}$ and 5th term $\frac{1}{20}$. Find: **(a)** the general term and **(b)** the 15th term of the sequence.	**04**
(v)	Without drawing graph find range, amplitude, period and frequency of the function $y = -3sin\left(5x + \frac{\pi}{3}\right)$	**04**	**OR**	A force $\vec{F} = 5\hat{i} + 3\hat{j} + 4\hat{k}$ is applied to move an object from $A(2,3,1)$ to $B(5,7,4)$. Find work done by the force.	**04**
(vi)	In an arithmetic sequence, first term is 12, and 10th term is 48. Find: **a)** the common difference and **b)** the sum of the first 12 terms of the sequence.	**04**	**OR**	Verify that: $\dfrac{cos\theta + cos4\theta + cos7\theta}{sin\theta + sin4\theta + sin7\theta} = \cot 4\theta$	**04**
(vii)	Verify that $\begin{vmatrix} a+k & a & a \\ a & a+k & a \\ a & a & a+k \end{vmatrix} = k^2(3a+k)$	**04**	**OR**	If $\sin\theta = -\frac{3}{5}$ and θ lies in 3rd quadrant, find the exact values of **(a)** $\cos(180^\circ + \theta)$ **(b)** $\tan(270^\circ - \theta)$	**04**
(viii)	A falcon dives from a height of 100 meters to catch its prey and then ascends back to 85% of its previous height after each unsuccessful attempt. Find the total vertical distance travelled by the falcon before stopping its attempts.	**04**	**OR**	A boat is sailing north at 10 km/h but is also being pushed east by ocean currents at 5 km/h. Find: **(a)** actual speed (V) of the boat. **(b)** direction angle (θ) of the boat relative to due north. 	**04**
(ix)	Use principle of mathematical induction to prove that: $1^2 + 2^2 + 3^2 + \cdots + n^2 = \dfrac{n(n+1)(2n+1)}{6}$ $\forall n \in N,\ n \geq 1$	**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)	Solve the simultaneous linear equations $2iz - 3iw = 4$ and $-3iz + 5iw = 9$ carrying complex coefficients $\left(i = \sqrt{-1}\right)$.	**04**	**OR**	A bakery offers 2 types of breads, 7 types of fillings and 5 types of sauces for a custom sandwich: **(a)** How many different sandwich combinations can be made? **(b)** How many weeks can a customer eat a different sandwich each day without repetition?	**04**
(xi)	Find the term containing x^4 in the expansion of $(2x-3)^7$.	**04**	**OR**	A checksum polynomial $C(x) = x^4 + px^2 + qx + 6$ is used to detect errors in transmitted data. **(a)** If $C(1)=10$ and $C(-1)=4$, set equations for p and q. **(b)** Solve the equations to find values of p and q.	**04**
(xii)	Solve the system $x - y + z = 1;\ x - z = 2;\ z = 3$ using Cramer's rule.	**04**	**OR**	Use binomial theorem to approximate the value of $\dfrac{(1.03)^4}{(0.98)^3}$ upto three places of the 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	A polynomial $P(x)=x^4+ax^3-5x^2+bx+c$ **(a)** Leaves remainder 0 when divided by $(x-0)$ **(b)** Leaves remainder –3 when divided by $(x-2)$ **(c)** Leaves remainder –4 when divided by $(x+1)$ Use remainder theorem to find values of a,b and c	**08**	**OR**	If $\vec{a}=5\hat{i}-3\hat{j}+\hat{k}$ and $\vec{b}=-2\hat{i}+6\hat{j}+4\hat{k}$, 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 $\frac{(8+2x)^{\frac{2}{3}}}{(2+x)(\sqrt{4-2x})}\approx 1-\frac{x}{12}$	**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 the system $x+y+z=6,\ 2x+3y+z=11,\ 3x+y+2z=8$ using the Gaussian elimination method.	**08**	**OR**	$y=2\sin(2x)\ ;\ -\frac{\pi}{2}\le x\le\frac{\pi}{2}$ **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: $1(1)+3\left(\frac{1}{2}\right)+5\left(\frac{1}{4}\right)+7\left(\frac{1}{8}\right)+9\left(\frac{1}{16}\right)+....$ **(a)** Find n^{th} term of the series , **(b)** Sum the series up to n terms and **(c)** Sum the series up to infinite terms	**08**	**OR**	A basketball club has 7 forwards and 5 guards. In how many ways a team of 5 can be selected if it includes: **(a)** 3 forwards and 2 guards? **(b)** 4 forwards and 1 guard? **(c)** At least 4 forwards? **(d)** At the most 1 guard?	**08**