Roll No. | | | | | | | Answer Sheet No._____

Sig. of Candidate._____ Sig. of Invigilator._____

MATHEMATICS HSSC–I

SECTION – A (Marks 20)

Time allowed: 25 Minutes **Version Number** | 1 | 7 | 0 | 2 |

NOTE: **Section–A is compulsory. All parts of this section are to be answered on the question paper itself. It should be completed in the first 25 minutes and handed over to the Centre Superintendent. Deleting/overwriting is not allowed. Do not use lead pencil.**

Q. 1 **Circle the correct option i.e. A / B / C / D. Each part carries one mark.**

(i) Reference angle lies in quadrant:
A. IV B. I C. II D. III

(ii) The set $\{0,1\}$ is closed w.r.t:
A. Division B. Addition C. Subtraction D. Multiplication

(iii) $\sqrt{-5}$ belongs to the set of:
A. Rational Numbers B. Real Numbers
C. Complex Numbers D. Integers

(iv) The set of integers Z is a group under:
A. Addition B. Subtraction C. Division D. Multiplication

(v) A declarative statement which may be true or false but not both is called:
A. Tautology B. Proposition C. Deduction D. Induction

(vi) If $A=\begin{bmatrix} x & 1 \\ 1 & 1 \end{bmatrix}$ and A is singular matrix, then $x=$
A. 3 B. 0 C. 1 D. 2

(vii) The product of all fourth roots of unity is:
A. 2 B. 1 C. 0 D. -1

(viii) A fraction in which the degree of numerator is less than the degree of the denominator is called:
A. Algebraic Relation B. Improper Fraction
C. Proper Fraction D. Equation

(ix) $1^3+2^3+3^3+.....+n^3=$
A. $\frac{n^2(n+1)^2}{4}$ B. $\frac{n(n+1)(2n+1)}{6}$ C. $\left[\frac{n(n+1)}{2}\right]^3$ D. $\frac{n(n+1)(2n+1)}{3}$

(x) An infinite Geometric series converges only if:
A. $r=-1$ B. $r=1$ C. $|r|>1$ D. $|r|<1$

(xi) An event E is said to be sure if:
A. $P(E)=\infty$ B. $P(E)=0$ C. $P(E)=1$ D. $P(E)=-1$

(xii) Numbers of terms in the expansion of $(a+b)^n$ is:
A. n^2+1 B. $n+1$ C. $n-1$ D. n

(xiii) The sum of odd coefficients in the expansion of $(1+x)^n$ is:
A. 2^{n+1} B. n^2 C. 2^n D. 2^{n-1}

(xiv) $\tan\left(\frac{3\pi}{2}-\theta\right)=$
A. $-\cot\theta$ B. $\tan\theta$ C. $-\tan\theta$ D. $\cot\theta$

(xv) If $\cot\theta<0$ and if $\cos\theta>0$, then the terminal arm of angle lies in the quadrant:
A. IV B. I C. II D. III

(xvi) $\sin 3\alpha=$
A. $4\sin\alpha-3\sin^3\alpha$ B. $4\cos^3\alpha-3\cos\alpha$ C. $3\cos^3\alpha-4\cos\alpha$ D. $3\sin\alpha-4\sin^3\alpha$

(xvii) The period of $3\sin 3x$ is:
A. 6π B. $\frac{\pi}{3}$ C. $\frac{\pi}{2}$ D. $\frac{2\pi}{3}$

(xviii) The range of $\cot x$ is:
A. R^- B. R C. $[-1,1]$ D. R^+

(xix) The circle passing through the vertices of the triangle is called:
A. Unit circle B. Circum circle C. In-circle D. Escribed circle

(xx) The domain of principal cosine function is:
A. $\left[-\frac{\pi}{2},\frac{\pi}{2}\right]$ B. $\left[0,\frac{\pi}{2}\right]$ C. $[0,\pi]$ D. $\left[0,\frac{3\pi}{2}\right]$

For Examiner's use only:

Total Marks: 20

Marks Obtained:

MATHEMATICS HSSC–I

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

NOTE: Attempt any ten parts from Section 'B' and any five questions from Section 'C' on the separately provided answer book. Use supplementary answer sheet i.e. Sheet–B if required. Write your answers neatly and legibly. Graph paper will be provided on request.

SECTION – B (Marks 40)

Q. 2 Attempt any TEN parts. All parts carry equal marks. **(10 x 4 = 40)**

(i) Simplify by using De Moivre's Theorem $\left(\frac{-1}{2}+\frac{\sqrt{3}}{2}i\right)^3$

(ii) Give logical prove of the theorem $(A\cup B)' = A'\cap B'$

(iii) Without expansion verify that $\begin{vmatrix} -a & 0 & c \\ 0 & a & -b \\ b & -c & 0 \end{vmatrix} = 0$

(iv) Find the values of a and b if -2 and 2 are the roots of the polynomial $x^3 - 4x^2 + ax + b$.

(v) Resolve into partial fractions $\frac{x^2+1}{x^3+1}$

(vi) Insert four harmonic means between $\frac{7}{3}$ and $\frac{7}{11}$.

(vii) Find the values of n and r, when ${}^{n-1}C_{r-1} : {}^nC_r : {}^{n+1}C_{r+1} = 3:6:10$

(viii) Show that the middle term of $(1+x)^{2n}$ is $\frac{1.3.5....(2n-1)}{n!}2^n x^n$.

(ix) Prove that $\frac{\tan\theta+\sec\theta-1}{\tan\theta-\sec\theta+1} = \tan\theta+\sec\theta$

(x) Without using table or calculator, prove that $\sin 19^\circ \cos 11^\circ + \sin 71^\circ \sin 11^\circ = \frac{1}{2}$

(xi) Find the period of cosine function.

(xii) The sides of the triangle are x^2+x+1, $2x+1$ and x^2-1. Prove that the greatest angle of the triangle is 120°.

(xiii) Show that $\cos^{-1}(-x) = \pi - \cos^{-1} x$

(xiv) Solve $\sin x + \cos x = 0$

SECTION – C (Marks 40)

Note: Attempt any FIVE questions. All questions carry equal marks. **(5 x 8 = 40)**

Q. 3 Use matrices to solve the following system

$$x+y = 2$$
$$2x-z = 1$$
$$2y-3z = -1$$

Q. 4 Show that the roots of equation $(x-a)(x-b)+(x-b)(x-c)+(x-c)(x-a)=0$ are real.

Also show that the roots will be equal only if $a=b=c$.

Q. 5 Show that the sum of n A.Ms between a and b is equal to n times their A.M.

Q. 6 Expand $\frac{(4+2x)^{\frac{1}{2}}}{2-x}$ up to 4 terms.

Q. 7 Prove that: $\sin\frac{\pi}{9}\sin\frac{2\pi}{9}\sin\frac{\pi}{3}\sin\frac{4\pi}{9} = \frac{3}{16}$

Q. 8 Prove that in an equilateral triangle $r : R : r_1 = 1:2:3$

Q. 9 Solve the equation $\operatorname{cosec} x = \sqrt{3} + \cot x$

Roll No. | | | | | | |

Answer Sheet No._____

Sig. of Candidate._____

Sig. of Invigilator._____

MATHEMATICS HSSC–I

SECTION – A (Marks 20)

ıe allowed: 25 Minutes

Version Number | 1 | 7 | 0 | 5 |

TE: Section–A is compulsor. All parts of this section are to be answered on the question paper itself. It should be completed in the first 25 minutes and handed over to the Centre Superintendent. Deleting/overwriting is not allowed. Do not use lead pencil.

Circle the correct option i.e. A / B / C / D. Each part carries one mark.

(i) $\sqrt{3}$ is:
A. Odd Number B. Comlex Number
C. An Irrational Number D. Rational Number

(ii) The value of i in ordered pair is:
A. $(0,0)$ B. $(1,0)$ C. $(0,1)$ D. $(-1,0)$

(iii) The function from A to B is called on to function if its range is:
A. A B. B C. A – B D. $A \cup B$

(iv) The set of all cube roots of unity is group under the binary operation:
A. Addition B. Subtraction C. Multiplication D. Division

(v) If $A=\begin{bmatrix} x & 1 \\ 1 & 1 \end{bmatrix}$ and A is singular matrix, then $x=$
A. 0 B. 1 C. -1 D. 2

(vi) The cube roots of -27 are:
A. $-3,-3\omega,-3\omega^2$ B. $3,3\omega,3\omega^2$ C. $9,9\omega,9\omega^2$ D. $3,\omega,\omega^2$

(vii) $(x+2)^2=x^2+4x+4$ is:
A. A linear equation B. Cubic equation
C. An identity D. An Equation

(viii) No term of the geometric sequence is:
A. 1 B. 2 C. 0 D. 3

(lx) ${}^4C_4$ =
A. 4 B. 16 C. 1 D. 8

(x) An event is said to be impossible if:
A. $P(E)=1$ B. $P(E)=\frac{1}{2}$ C. $P(E)=0$ D. $P(E)=\infty$

(xi) The middle term in the expansion of $(1+2x)^6$ is:
A. 3rd B. 4th C. 5th D. 3rd and 4th

(xii) The sum of odd coefficients in the expansion of $(1+x)^3$ is:
A. 8 B. 4 C. 12 D. 16

(xiii) Which angle is quadrental angle?
A. 120° B. 270° C. 60° D. 45°

(xiv) $1^\circ \approx$
A. 1 radian B. 0.5 radian C. 0.01745 radian D. 2.5 radian

(xv) If $\tan\theta > 0$ and if $\sin\theta < 0$, then the terminal arm of angle lies in the quadrant:
A. I B. II C. III D. IV

(xvi) The range of $\cot x$ is:
A. $[-1,1]$ B. R C. R^+ D. R^-

(xvii) Radius of inscribed circle is:
A. $r=\frac{\Delta}{S}$ B. $r=\frac{abc}{4\Delta}$ C. $r=\frac{S}{\Delta}$ D. $r=\frac{\Delta}{S-a}$

(xviii) The inverse of a function is function if it is:
A. On to B. One-One C. Bijective D. In-to

(xix) The domain of principal sine function is:
A. $\left[0,\frac{\pi}{2}\right]$ B. $\left[-\frac{\pi}{2},\frac{\pi}{2}\right]$ C. $[0,2\pi]$ D. R

(xx) Reference angle lies in quadrant:
A. I B. II C. III D. IV

For Examiner's use only:

Total Marks: 20

Marks Obtained:

MATHEMATICS HSSC–I

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

NOTE: Attempt any ten parts from Section 'B' and any five questions from Section 'C' on the separately provided answer book. Use supplementary answer sheet i.e. Sheet–B if required. Write your answers neatly and legibly. Graph paper will be provided on request.

SECTION – B (Marks 40)

Q. 2 Attempt any TEN parts. All parts carry equal marks. **(10 x 4 = 40)**

(i) Find out real and imaginary parts of $\left(\sqrt{3}+i\right)^3$ by using De Moivre's theorem.

(ii) Without expansion show that $\begin{vmatrix} x & a+x & b+c \\ x & b+x & c+a \\ x & c+x & a+b \end{vmatrix} = 0$

(iii) If the roots of $px^2+qx+q=0$ are α and β then prove that: $\sqrt{\frac{\alpha}{\beta}}+\sqrt{\frac{\beta}{\alpha}}+\sqrt{\frac{q}{p}}=0$

(iv) Resolve $\frac{x^4}{1-x^4}$ in to partial fractions.

(v) If $a=1-x+x^2-x^3+.....$ and $b=1+x+x^2+x^3+.....$, and $|x|<1$. Show that $2ab=a+b$

(vi) Sum to n terms the series $0.2+0.22+0.222+.....$

(vii) How many signals can be made by 4 different flags when any number of them is to be used at a time?

(viii) Find the term involving y^3 in the expansion of $\left(x-\sqrt{y}\right)^{11}$.

(ix) Find the value of trigonometric functions of the angle $\frac{-71\pi}{6}$

(x) Reduce $\cos^4\theta$ to an expression involving only function of multiples of θ raised to the first power.

(xi) Find the period of cosine function.

(xii) Prove that $R=\frac{abc}{4\Delta}$

(xiii) Show that $\text{Cos}^{-1}(-x)=\pi-\text{Cos}^{-1}x$

(xiv) Find the value of θ satisfying the equation $4\text{Sin}^2\theta-8\text{Cos}\theta+1=0$

SECTION – C (Marks 40)

Note: Attempt any FIVE questions. All questions carry equal marks. **(5 x 8 = 40)**

Q. 3 Show that the set $S=\{1,-1,i,-i\}$ is an abelian group under multiplication.

Q. 4 Solve the equation $x^2-\frac{x}{2}-7=x-3\sqrt{2x^2-3x+2}$

Q. 5 If three consecutive numbers in A.P are increased by 1, 4, 15 respectively, the resulting numbers are in G.P. find the original numbers if their sum is 6.

Q. 6 If $2y=\frac{1}{2^2}+\frac{1.3}{2!}.\frac{1}{2^4}+\frac{1.3.5}{3!}.\frac{1}{2^6}+.....$, then prove that $4y^2+4y-1=0$

Q. 7 If α,β and γ are the angles of a triangle ABC, then prove that $\cot\frac{\alpha}{2}+\cot\frac{\beta}{2}+\cot\frac{\gamma}{2}=\cot\frac{\alpha}{2}\ \cot\frac{\beta}{2}\ \cot\frac{\gamma}{2}$

Q. 8 Prove that $r_1+r_2+r_3-r=4R$

Q. 9 Find the rank of the matrix $\begin{bmatrix} 1 & -1 & 2 & -3 \\ 2 & 0 & 7 & -7 \\ 3 & 1 & 12 & -11 \end{bmatrix}$