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

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

MATHEMATICS HSSC–I

SECTION – A (Marks 20)

Time allowed: 25 Minutes

NOTE: Section–A is compulsory and comprises pages 1-2. 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) The Multiplicative inverse of complex number (a,b) is _____

A. $\left(\frac{-a}{a^2+b^2}, \frac{-b}{a^2+b^2}\right)$ B. $\left(\frac{+a}{a^2+b^2}, \frac{+b}{a^2+b^2}\right)$

C. $\left(\frac{a}{a^2+b^2}, \frac{-b}{a^2+b^2}\right)$ D. $\left(\frac{-a}{a^2+b^2}, \frac{b}{a^2+b^2}\right)$

(ii) If $z = -2-3i$, then $z-\bar{z}$ is _____

A. -4 B. $-6i$ C. $6i$ D. $4i$

(iii) The contra-positive of $p \rightarrow q$ is_____

A. $\sim q \rightarrow \sim p$ B. $\sim p \rightarrow \sim q$ C. $\sim q \rightarrow p$ D. None of these

(iv) The set $\{1,-1,i,-i\}$ posseses Closure Property with respect to_____

A. Addition B. Multiplication

C. Division D. Subtraction

(v) If all the elements in a square matrix A=$[a_{ij}]$ below the principal diagonal are zero

i.e. $[a_{ij}]$=0 $\forall i > j$ its called_____

A. Upper Triangular Matrix B. Triangular Matrix

C. Lower Triangular Matrix D. None of these

(vi) In a square matrix A=$[a_{ij}]$, if $a_{ij} = 0 \forall i \neq j$ and a_{ij} =K, then matrix A is called _____

A. Diagonal matrix B. Scalar matrix

C. Unit matrix D. Null matrix

(vii) $1 \times (-1) \times i \times (-i)$ = _____

A. 1 B. i

C. $-i$ D. -1

(viii) If Discriminant = $b^2 - 4ac$ is a perfect square, then roots are _____

A. Irrational B. Rational

C. Imaginary D. Repeated equal

(ix) If $a_n - a_{n-1} = n+2$, $a_1 = 2$ then a_3 =_____

A. 6 B. 4 C. 11 D. 17

(x) The positive G. Mean of -2 and 8 is_____

A. 4i B. $-4i$ C. 4 D. -4

DO NOT WRITE ANYTHING HERE

(xi) If a die is rolled, then the probability of the dots on the top are greater than 4 is_____

A. $\frac{1}{6}$ B. $\frac{1}{3}$ C. $\frac{1}{4}$ D. $\frac{1}{2}$

(xii) The sum of co-efficients in the binomial expansion is _____

A. 2^{n-1} B. 2^{n-1} C. $(n+1)2^n$ D. 2^n

(xiii) $\cos\theta < 0$ *and* $\tan\theta < 0$ lie in_____ quadrant.

A. I B. II C. III D. IV

(xiv) Value of $\sin^2\left(\frac{\pi}{6}\right)+\sin^2\left(\frac{\pi}{3}\right)+\tan^2\left(\frac{\pi}{4}\right)$ is _____

A. $\frac{2}{3}$ B. $\frac{3}{2}$ C. 3 D. 2

(xv) The angles associated with basic angles of the measure θ to a right angle or its multiple are called _____ angles.

A. Supplementary B. Complementary
C. Obtuse D. Allied

(xvi) $\sin\left(\theta+\frac{\pi}{6}\right)+\cos\left(\theta+\frac{\pi}{3}\right)=$ _____

A. $\cos\theta$ B. $\sin\theta$
C. $\sec\theta$ D. $\operatorname{cosec}\theta$

(xvii) The period of trigonometric function $3\cos\frac{x}{5}$ is_____

A. 2π B. 10π
C. 5π D. None of these

(xviii) In any triangle ABC $r_1r_2r_3$=----------

A. rs^2 B. s^2
C. Δ^2 D. $r\Delta^2$

(xix) The value of $\sin(\cos^{-1}\frac{\sqrt{3}}{2})$ is_____

A. $\frac{\sqrt{3}}{2}$ B. $\frac{1}{\sqrt{2}}$ C. $\frac{1}{2}$ D. $\frac{1}{\sqrt{3}}$

(xx) The solution set of trigonometric equation $1+\cos x = 0$ is _____

A. $\{2n\pi\}$ B. $\{\pi+2n\pi\}$
C. $\{2\pi+n\pi\}$ D. None of these

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.

SECTION – B (Marks 40)

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

(i) Simplify $\left(-\frac{1}{2}+\frac{\sqrt{3}}{2}i\right)^3$

(ii) Give logical proof of $(AUB)' = A' \cap B'$ where A and B are any sets.

(iii) Find x and y if $\begin{bmatrix} 2 & 0 & x \\ 1 & y & 3 \end{bmatrix} + 2\begin{bmatrix} 1 & x & y \\ 0 & 2 & -1 \end{bmatrix} = \begin{bmatrix} 4 & -2 & 3 \\ 1 & 6 & 1 \end{bmatrix}$

(iv) If α, β are the roots of $ax^2+bx+c=0$, $a \neq 0$, then prove that $\alpha+\beta = \frac{-b}{a}$ and $\alpha\beta = \frac{c}{a}$

(v) Resolve into Partial Fraction $\frac{x^2+1}{(x+1)(x-1)}$

(vi) Determine whether -19 and 2 are the terms of the A.P. 17, 13, 9,..... or not.

(vii) Find the values of 'n' and 'r' when ${}^nC_r = 35$ and ${}^nP_r = 210$

(viii) Prove by Mathematical Induction $2+6+18+\text{----------}+2\times 3^{n-1} = 3^n - 1$

(ix) Prove that $\frac{1+\cos\theta}{1-\cos\theta} = (\operatorname{cosec}\theta + \cot\theta)^2$.

(x) Without using calculator and tables, find the values of all trigonometric functions of 75^0.

(xi) The area of triangle is 121.34. If $\alpha = 32^0 15'$; $\beta = 65^0 37'$ then find c and angle γ.

(xii) Show that $\cos(2\sin^{-1}x) = 1-2x^2$ without using calculator and table.

(xiii) Solve the trigonometric equation $\tan^2\theta = \frac{1}{3}$

(xiv) Prove that R= $\frac{abc}{4\Delta}$ using half angle formulas.

SECTION – C (Marks 40)

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

Q. 3 Find the value of 'λ' for which the system has non-trivial solution. Also solve the system for the value of 'λ'

$$\left.\begin{aligned} x_1 + 4x_2 + \lambda x_3 &= 0 \\ 2x_1 + x_2 - 3x_3 &= 0 \\ 3x_1 + \lambda x_2 - 4x_3 &= 0 \end{aligned}\right\}$$

Q. 4 Solve the equations $(x^2+6x+8)(x^2+14x+48) = 105$

Q. 5 If the numbers 1,4 and 3 are subtracted from three consecutive terms of an A.P; the resulting numbers are in G.P. Find the numbers if their sum is 21.

Q. 6 Show that $\left[\frac{n}{2(n+N)}\right]^{\frac{1}{2}} \approx \frac{8n}{9n-N} - \frac{n+N}{4n}$ where 'n' and 'N' are nearly equal.

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 ABC, $r : R : r_1 = 1 : 2 : 3$

Q. 9 Solve the trigonometric equation $\sin x + \sin 3x + \sin 5x = 0$

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MATHEMATICS HSSC–I

SECTION – A (Marks 20)

Time allowed: 25 Minutes

NOTE: Section–A is compulsory and comprises pages 1-2. 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) If a complex number $z = 1 - i\sqrt{3}$ then $|z| =$ _____

A. 4 B. 2 C. 3 D. $-2i$

(ii) If $S = \{1, -1, i, -i\}$, then set 'S' is an abelian group with respect to_____

A. Addition B. Multiplication C. Subtraction D. Division

(iii) The system of linear equations has unique solution if_____

A. $|A| \neq 0$ B. $|A| > 0$ C. $|A| < 0$ D. $|A| = 0$

(iv) If $A = \left[a_{ij}\right]_{m \times n}$ is a square matrix and $A^t = -A$ then A is_____

A. Symmetric B. Skew Symmetric

C. Hermitian D. None of these

(v) The sum of cube roots of unity is_____

A. 0 B. 1 C. 2 D. 3

(vi) If $b^2 - 4ac = 0$ then the roots of equation are_____

A. Rational B. Distinct

C. Real and Equal D. Imaginary

(vii) A rational fraction $\frac{P(x)}{Q(x)}$ in which degree of P(x) is less than the degree of $Q(x)$ is called_____

A. Improper fraction B. Proper fraction

C. Common fraction D. None of these

(viii) A.M between $\sqrt{2}$ *and* $3\sqrt{2}$ is _____

A. $4\sqrt{2}$ B. $2\sqrt{2}$ C. 6 D. None of these

(ix) The sum of the infinite G.P. $2, \sqrt{2}, 1, \ldots\ldots$ is _____

A. $3 + 2\sqrt{2}$ B. $2 + 2\sqrt{2}$

C. $4 + 2\sqrt{2}$ D. $5 + 2\sqrt{2}$

(x) The number of diagonals of a 6-sided figure is_____

A. 9 B. 10 C. 11 D. 12

(xi) In expansion of Binomial Theorem, the General Term is_____

A. $\binom{n}{r} a^{n-r} b$ B. $\binom{n}{r} a^{n-r} b^r$

C. $\binom{n}{r} a^r b^r$ D. None of these

DO NOT WRITE ANYTHING HERE

(xii) $2\sin 45^0 + \frac{1}{2}\operatorname{cosec} 45^0 =$ _____

A. $\frac{3}{\sqrt{2}}$ B. $\frac{1}{\sqrt{2}}$ C. 2 D. $\frac{5}{\sqrt{2}}$

(xiii) The measure of $\pi + \theta$ or $\frac{3\pi}{2} - \theta$ lies in the_____quadrant.

A. I B. II C. III D. IV

(xiv) $\sin(\alpha + \beta) - \sin(\alpha - \beta) =$ _____

A. $2\cos\alpha \sin\beta$ B. $2\sin\alpha \cos\beta$

C. $2\cos\alpha \cos\beta$ D. $-2\sin\alpha \sin\beta$

(xv) The period of $\tan\frac{x}{3}$ is _____

A. 2π B. π C. 3π D. 4π

(xvi) In triangle ABC, if vertex A is at origin then the law of cosine is_____

A. $a^2 = b^2 + c^2 + 2bc\ cos\alpha$ B. $a^2 = b^2 + c^2 - 2bc\ cos\alpha$

C. $b^2 = a^2 + c^2 - 2ac\ cos\beta$ D. $a^2 = b^2 + c^2 - 2bc\ cos\beta$

(xvii) In triangle ABC if one side 'C' and two angles α, β are given then Area=_____

A. $\frac{a^2 \sin\alpha \sin\beta}{2\sin\gamma}$ B. $\frac{b^2 \sin\alpha \sin\gamma}{2\sin\beta}$

C. $\frac{c^2 \sin\alpha \sin\beta}{2\sin\gamma}$ D. $\frac{c^2 \sin\alpha \sin\beta}{\sin\gamma}$

(xviii) Circum-centre of circle is the point of intersection of the_____

A. Perpendiculars B. Right Bisectors

C. Bisectors of angles D. Bisectors of sides

(xix) Range of $\tan^{-1} x$ is_____

A. $\frac{-\pi}{2} \le x \le \frac{\pi}{2}$ B. $0 \le x \le \pi$

C. $0 < x < \pi$ D. None of these

(xx) If $\cot x = \frac{1}{\sqrt{3}}$ *then* $x =$ _____ in interval $[0, 2\pi]$.

A. $\frac{\pi}{3}, \frac{4\pi}{3}$ B. $\frac{\pi}{6}, \frac{5\pi}{6}$

C. $\frac{2\pi}{3}$ D. $\frac{5\pi}{6}$

For Examiner's use only:

Total Marks:	**20**
Marks Obtained:	

MATHEMATICS HSSC–I

32

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.

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 $(\sqrt{3}+i)^3$ by De -Moivre's Theorem.

(ii) If a, b are elements of a group 'G' then solve the equations $ax=b$ and $xa=b$.

(iii) Solve the matrix equation for 'A' when $\begin{bmatrix}4 & 3\\ 2 & 2\end{bmatrix}A-\begin{bmatrix}2 & 3\\ -1 & -2\end{bmatrix}=\begin{bmatrix}-1 & -4\\ 3 & 6\end{bmatrix}$

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

(v) When the polynomial $x^4+2x^3+kx^2+3$ is divided by $x-2$, the remainder is 1. Find the value of k using Synthetic division.

(vi) Resolve into Partial Fraction $\frac{6x^3+5x^2-7}{2x^2-x-1}$

(vii) If $3a_7=7a_4$ and $a_{10}=33$ then find the first four terms of A.P.

(viii) There are 20 chits marked 1,2,3,....., 20 in a bag. Find the probability of picking a chit, the number written on which is a multiple of 4 or a multiple of 7.

(ix) If 'x' is so small that its square and its higher powers can be neglected then show that:
$\frac{\sqrt{1+2x}}{\sqrt{1-x}}\approx 1+\frac{3}{2}x$

(x) Find 'x' if $tan^2 45^0-cos^2 60^0=x\ sin45^0 cos45^0\ tan60^0$

(xi) Prove that $\frac{2sin\theta sin2\theta}{cos\theta+cos3\theta}=\tan 2\theta\tan\theta$

(xii) In any triangle ABC, prove that $\sin\left(\frac{\alpha}{2}\right)=\sqrt{\frac{(s-b)(s-c)}{bc}}$, where s is semi-perimeter of triangle?

(xiii) Without using calculator and tables ,show that $2cos^{-1}\frac{4}{5}=sin^{-1}\frac{24}{25}$ where $0<\alpha<\frac{\pi}{2}$

(xiv) Solve the trigonometric equation $cosec^2\theta=\frac{4}{3}$

SECTION – C (Marks 40)

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

Q. 3 Solve the system of equations using Cramer's rule:

$$\left.\begin{aligned}2x_1-x_2+x_3&=8\\ x_1+2x_2+2x_3&=6\\ x_1-2x_2-x_3&=1\end{aligned}\right\}$$

Q. 4 Solve the equations $12x^2-11xy+2y^2=0$; $2x^2+7xy=60$

Q. 5 The ratio of the sums of n terms of two series in A.P is $3n+2:n+1$. Find the ratio of their 8^{th} terms.

Q. 6 If $y=\frac{1}{2}\left(\frac{4}{9}\right)+\frac{1.3}{2^2 2!}\left(\frac{4}{9}\right)^2+\frac{1.3.5}{2^3 3!}\left(\frac{4}{9}\right)^3+$..... then show that $5y^2+10y-4=0$

Q. 7 Reduce $sin^4\theta$ to an expression involving only function of multiples of θ raised to the first power.

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

Q. 9 Find the solution set of trigonometric equation $sinx+cos3x=cos5x$