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) i^{18} =_____

A. 3 B. 2 C. 1 D. –1

(ii) $\frac{4}{1+i}$ is_____

A. $1+i$ B. $1-i$ C. $2(1+i)$ D. $2(1-i)$

(iii) $\left(x^C \cup y^C\right)$ =_____

A. $x \cap y$ B. $x \cup y$ C. $(x \cap y)^C$ D. None of these

(iv) If $\begin{bmatrix} 5 & 2 \\ -2 & 1 \end{bmatrix} X = \begin{bmatrix} -1 & 5 \\ 12 & 3 \end{bmatrix}$ then X=_____

A. $\begin{pmatrix} 1 & -3 \\ 2 & -1 \end{pmatrix}$ B. $\begin{pmatrix} 1 & 3 \\ 2 & -1 \end{pmatrix}$ C. $\begin{pmatrix} 2 & 3 \\ 1 & 1 \end{pmatrix}$ D. $\begin{pmatrix} 2 & 3 \\ -1 & -1 \end{pmatrix}$

(v) For what value of m, the roots of the equation $(m+1)x^2+2(m+3)x+m+8=0$ are equal?

A. $\frac{-1}{2}$ B. $\frac{2}{3}$ C. $\frac{-1}{3}$ D. None of these

(vi) If ω is the cube roots of unity, then a quadratic equation whose roots are 2ω and $2\omega^2$ is_____

A. $x^2+2x+4=0$ B. $x^2-2x+4=0$

C. $x^2+x+4=0$ D. $x^2+2x-4=0$

(vii) If degree of P(x)=3 and degree of Q(x)=4, then $\frac{P(x)}{Q(x)}$ will be_____

A. Proper Rational Fraction B. Improper Rational Fraction

C. Polynomial D. None of these

(viii) If a,b,c are in G.P and $a>0, b>0, c>0$, then the reciprocals of a,b,c form_____

A. A.P B. G.P C. H.P D. None of these

(ix) If $\frac{1}{a}, \frac{1}{b}, \frac{1}{c}$ are in A.P then the common difference is_____

A. $\frac{a-c}{2ac}$ B. $\frac{2ac}{a-c}$ C. $\frac{a+c}{2ac}$ D. $\frac{2ac}{a+c}$

(x) A card is drawn from a pack of 52 cards at random. What is the probability that it is either a heart or a king?

A. $\frac{4}{13}$ B. $\frac{1}{13}$ C. $\frac{9}{13}$ D. $\frac{2}{13}$

DO NOT WRITE ANYTHING HERE

(xi) The middle terms in the expansion of $\left(\frac{x}{2}+\frac{2}{x^2}\right)^{12}$ will be_____

A. 5^{th} term B. 7^{th} term C. 8^{th} term D. 6^{th} term

(xii) Circular measure of the angle between the hands of a watch at a 4'O clock is _____

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

(xiii) If $\tan\theta=\frac{2}{5}$ and $0<\theta<\frac{\pi}{2}$ then $\frac{4\cos\theta+3\sin\theta}{\cos\theta-\sin\theta}$ =_____

A. $\frac{14}{3}$ B. $\frac{26}{3}$ C. $\frac{13}{7}$ D. None of these

(xiv) The angles $90^\circ\pm\theta, 180^\circ\pm\theta, 270^\circ\pm\theta, 360^\circ\pm\theta$ are the _____angle.

A. Composite B. Half C. Quadrantal D. Allied

(xv) The period of $3\cos\frac{x}{5}$ is_____

A. 5π B. 2π C. 10π D. 6π

(xvi) The in-radius r of a triangle is given by_____

A. $s\Delta$ B. $\frac{\Delta}{s}$ C. $\frac{s}{\Delta}$ D. None of these

(xvii) $sin\left(cos^{-1}\frac{\sqrt{3}}{2}\right)$ =_____

A. 0 B. $\frac{1}{2}$ C. $\frac{1}{6}$ D. $\frac{\sqrt{3}}{2}$

(xviii) If α and β are the roots of the equation $x^2-(p-1)x+c=0$ then $(1+\alpha)(1+\beta)$ =_____

A. 1–c B. c–2 C. –c D. None of these

(xix) Which term of 64,60,56,52,.....is zero?

A. 16^{th} B. 17^{th} C. 14^{th} D. 15^{th}

(xx) Multiplicative inverse of $1-2i$ is= _____

A. $\frac{1-2i}{5}$ B. $\frac{1+2i}{5}$ C. $\frac{1+2i}{4}$ 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) Without expansion verify that $\begin{vmatrix} 1 & a^2 & \frac{a}{bc} \\ 1 & b^2 & \frac{b}{ca} \\ 1 & c^2 & \frac{c}{ab} \end{vmatrix}=0$

(iii) Find the condition that $\frac{a}{x-a}+\frac{b}{x-b}=5$ may have roots equal in magnitude but opposite in signs.

(iv) Find the sum of 20 terms of the series whose rth term is 3r+1.

(v) Resolve into Partial Fraction $\frac{9x-7}{(x^2+1)(x+3)}$

(vi) Show that ${}^{16}C_{11}+{}^{16}C_{10}={}^{17}C_{11}$

(vii) Find the term independent of x in the expansion of $\left(\sqrt{x}+\frac{1}{2x^2}\right)^{10}$

(viii) If $\cot\theta=\frac{m^2-1}{2m}$ and $0<\theta<\frac{\pi}{2}$ find the value of remaining trigonometric ratios.

(ix) If $\sin\alpha=\frac{12}{13}$, then find the values of $\sin 2\alpha$ and $\cos 2\alpha$, where $0<\alpha<\frac{\pi}{2}$

(x) Draw the graph of $y=\tan x,\ x\in[-\pi,\pi]$ **Graph paper should be given to the candidates.**

(xi) Solve the triangle ABC if $\alpha=35^\circ 17',\ \beta=45^\circ 13',\ b=421$

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

(xiii) Solve $2x-y=4$ and $2x^2-4xy-y^2=6$

(xiv) Show that the statement $\sim q\wedge(p\to q)\to\sim q$ is a tautology.

SECTION – C (Marks 40)

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

Q. 3 Prove that $\sqrt{3}$ is an irrational number.

Q. 4 Find the value of λ for which the system has non-trivial solutions. Also find solution for the value of λ

$$\left.\begin{aligned} x+y+z&=0\\ 2x+y-\lambda z&=0\\ x+2y-2z&=0\end{aligned}\right\}$$

Q. 5 Show that roots of the equation $(x-a)(x-b)+(x-b)(x-c)+(x-c)(x-a)=0$ are real and will be equal only if a=b=c

Q. 6 If *m* and *n* are nearly equal show, that $\left(\frac{5m-2n}{3n}\right)^{\frac{1}{3}}\approx\frac{m}{m+2n}+\frac{n+m}{3n}$

Q. 7 If α,β,γ are the angles of a triangle ABC, then show 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 $r=\frac{\Delta}{s}$ with usual notation. Also show that $r_1=s\tan\frac{\alpha}{2}$

Q. 9 Solve the equation $\sin^2 x+\cos x=1$

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MATHEMATICS HSSC–I

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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) $i^{20} =$_____

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

(ii) $\frac{2}{1+i} =$_____

A. $1+i$ B. $1-i$ C. $2(1+i)$ D. $2(1-i)$

(iii) If A has 3 elements, B has 5 elements then maximum numbers of elements in $A \cup B$ is_____

A. 5 B. 3 C. 2 D. 8

(iv) If $A = \begin{pmatrix} 1 & -1 \\ a & b \end{pmatrix}$ and $A^2 = I$ then a and b are_____

A. a = 0 , b = –1 B. a = 1 , b = 0 C. a = 2 , b = 1 D. a = 3 , b = 0

(v) For what value of k, the sum of roots of the equation $x^2 + kx + 4 = 0$ is equal to the product of its roots?

A. ± 1 B. ± 4 C. 4 D. –4

(vi) If the roots of $x^2 - px + q = 0$ differ by unity then $p^2 - 4q =$_____

A. 0 B. 1 C. 2 D. –1

(vii) The rational fraction $\frac{P(x)}{Q(x)}$, where $Q(x) \neq 0$, is Proper Rational Fraction if_____

A. $DegP(x) = DegQ(x)$ B. $DegP(x) < DegQ(x)$

C. $DegP(x) > DegQ(x)$ D. None of these

(viii) If a^2, b^2, c^2 are in A.P, then $a+b, c+a, b+c$ are in_____

A. A.P B. G.P C. H.P D. None of these

(ix) If $\frac{1}{k}, \frac{1}{2k+1}, \frac{1}{4k-1}$ are in H.P, then the value of k is_____

A. 3 B. 2 C. 1 D. 4

(x) A die is rolled, what is the probability of getting a number which is even and greater than 2 ?

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

(xi) The expansion of $(1-2x)^{-\frac{1}{3}}$ is valid if_____

A. $|x| < 1$ B. $|x| > 1$ C. $|x| > \frac{1}{2}$ D. $|x| < \frac{1}{2}$

DO NOT WRITE ANYTHING HERE

(xii) $1^{o} =$_____

A. $\frac{\pi}{180}$ radian B. $\frac{180}{\pi}$ radian C. $\frac{1}{180\pi}$ radian D. 180π radian

(xiii) If $\cos\theta - \frac{\sqrt{3}}{2}$ and terminal side of the angle is not in 3rd quadrant then $\sin\theta$ is_____

A. $-\frac{1}{2}$ B. $\frac{1}{2}$ C. $\frac{\sqrt{3}}{2}$ D. None of these

(xiv) A reference angle θ is always_____

A. $0 < \theta < \frac{\pi}{2}$ B. $\frac{\pi}{2} < \theta < \pi$ C. $0 < \theta < \pi$ D. None of these

(xv) The period of $5\cos\frac{x}{3}$ is_____

A. 3π B. 2π C. 6π D. $\frac{5}{2}\pi$

(xvi) The in-radius r of a triangle is given by_____

A. $\frac{\Delta}{s}$ B. $\frac{abc}{4\Delta}$ C. $\frac{c}{2\sin r}$ D. $\frac{1}{2}bc\sin A$

(xvii) $\cos(2\sin^{-1}x) =$_____

A. $1-2x^2$ B. $1+2x^2$ C. $2x^2-1$ D. $1-x^2$

(xviii) If the roots of $ax^2+bx+c=0$ are real and unequal then_____

A. $b^2-4ac<0$ B. $b^2-4ac>0$

C. $b^2-4ac=0$ D. $b^2-4ab=0$

(xix) $2+(1-i)+\left(\frac{1}{i}\right)+\ldots\ldots$ is in_____

A. A.P B. G.P C. H.P D. None of these

(xx) If $z_1 = 1+2i, z_2 = 2+i$, then $\overline{(z_1 z_2)}$ is_____

A. $\frac{4-3i}{5}$ B. $\frac{4+3i}{5}$ C. $-5i$ D. None of these

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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) If $z_1 = 2+i, z_2 = 3-2i, z_3 = 1+3i$ then express $\frac{\overline{z_1}\cdot\overline{z_3}}{z_2}$ in the form of $a+bi$

(ii) Find the matrix A if $\begin{pmatrix} 2 & -1 \\ -1 & 2 \end{pmatrix} A = \begin{pmatrix} 0 & -3 & 8 \\ 3 & 3 & -7 \end{pmatrix}$

(iii) If α, β are the roots of $3x^2 - 2x + 4 = 0$, then find the value of $\alpha^3 + \beta^3$

(iv) If 5,8 are two A.Ms between a and b, then find a and b.

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

(vi) Show that ${}^{15}C_{11} + {}^{15}C_{10} = {}^{16}C_{11}$

(vii) Find the sixth term from the end in the expansion of $\left(\frac{3}{2}x - \frac{1}{3x}\right)^{11}$

(viii) Prove that $\sqrt{\frac{1-\sin\theta}{1+\sin\theta}} = \sec\theta - \tan\theta$; *where* $\theta \neq (2n+1)\frac{\pi}{2}, n \in Z$

(ix) Express $5\sin\theta - 4\cos\theta$ in the form $r\sin(\theta+\phi)$ where $0 < \theta < \frac{\pi}{2}, 0 < \phi < \frac{\pi}{2}$

(x) Find the length of the equatorial arc subtending an angle of 1° at the centre of the earth, taking the radius of the earth as 6400 km.

(xi) Solve the triangle ABC if $\gamma = 53^\circ, \alpha = 47^\circ, b = 125$

(xii) Show that $\sin^{-1}(-x) = -\sin^{-1}x$

(xiii) Solve $x + y = 7$ *and* $x^2 - xy + y^2 = 13$

(xiv) Construct the truth table for $\sim(p \to q) \leftrightarrow (p \wedge \sim q)$

SECTION – C (Marks 40)

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

Q. 3 Prove that $\sqrt{3}$ is an irrational number.

Q. 4 Find the inverse of the matrix $\begin{pmatrix} 1 & 2 & -1 \\ 0 & -1 & 3 \\ 1 & 0 & 2 \end{pmatrix}$

Q. 5 Solve the equation $\sqrt{3x^2 - 5x + 2} + \sqrt{6x^2 - 11x + 5} = \sqrt{5x^2 - 9x + 4}$

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

Q. 7 Let α *and* β be any two angles (real numbers), then $\cos(\alpha - \beta) = \cos\alpha\cos\beta + \sin\alpha\sin\beta$

Q. 8 Prove that $abc(\sin\alpha + \sin\beta + \sin\gamma) = 4\Delta s$

Q. 9 Find the solution set of $\cos ecx = \sqrt{3} + \cot x$