Roll No: | | | | | | | Answer Sheet No: _____

Signature of Candidate: _____ Signature of Invigilator: _____

Federal Board HSSC-I Examination
Mathematics Model Question Paper

SECTION – A

Time allowed: 30 minutes Marks: 20

Note: Section-A is compulsory and comprises pages 1-4. All parts of this section are to be answered on the question paper itself. It should be completed in the first 30 minutes and handed over to the Centre Superintendent. Deleting/overwriting is not allowed. Do not use lead pencil.

Q.1 Encircle the correct option i.e. A / B / C / D / E. All parts carry equal marks.

i. For a complex number (0, 0), what will be the additive inverse?

A. (0, 0) B. Does not exist
C. (0, 1) D. (1, 0)
E. (1, 1)

ii. In complex numbers, what is the multiplicative inverse of i?

A. $-i$ B. 1
C. -1 D. i
E. 0

iii. What is the contrapositive of the statement $p \to q$?

A. $q \to p$ B. $\sim q \to \sim p$
C. $\sim q \to p$ D. $\sim p \to \sim q$
E. $q \to \sim p$

iv. Which of the following is true for the set of Natural numbers under addition?

A. Monoid B. Semigroup
C. Group D. Abelain group
E. Contains 0

v. What is the value of the determinant $\begin{vmatrix} 1 & 2 & -5 \\ 0 & 0 & 0 \\ 1 & -2 & 3 \end{vmatrix}$?

A. 0 B. -1
C. 5 D. 3
E. 2

vi. For what value of α, $\begin{vmatrix} 2 & 3 & 0 \\ 3 & 9 & 6 \\ 2 & 15 & 1 \end{vmatrix} = \alpha \begin{vmatrix} 2 & 1 & 0 \\ 1 & 1 & 2 \\ 2 & 5 & 1 \end{vmatrix}$

A. 3 B. 6
C. 9 D. 12
E. 15

DO NOT WRITE ANYTHING HERE

vii. What is the solution set of the quadratic equation $x^2 - 2x + 1 = 0$?

A. {0, 1} B. {1}
C. {–1, 1} D. {0, –1}
E. {1, 2}

viii. What is the sum of the roots of quadratic equation $x^2 - 5x + 6 = 0$?

A. 5 B. –5
C. 6 D. –6
E. $\frac{5}{6}$

ix. What are the partial fractions of $\frac{3x+25}{(x+3)(x+4)}$?

A. $\frac{3}{x+4} + \frac{3}{x+3}$ B. $\frac{3}{x+4} + \frac{4}{x+3}$
C. $\frac{4}{x+4} - \frac{3}{x+3}$ D. $\frac{-4}{x+4} + \frac{3}{x+3}$
E. $\frac{-4}{x+4} + \frac{-3}{x+3}$

x. For which of the following expressions $\frac{1}{x+2} - \frac{3}{(x+2)^2} + \frac{1}{(x+2)^3}$ are the partial fractions?

A. $\frac{x^2-x+1}{(x+2)^3}$ B. $\frac{x^2+x-1}{(x+2)^3}$
C. $\frac{x^2-x-1}{(x+2)^3}$ D. $\frac{x^3-x^2+1}{(x+2)^3}$
E. $\frac{1-x+x^2}{(x+2)^3}$

xi. What is the arithmetic mean between $\sqrt{2}$ and $3\sqrt{2}$?

A. $\frac{3}{\sqrt{2}}$ B. $2\sqrt{2}$
C. $\frac{2}{\sqrt{2}}$ D. $\frac{4}{\sqrt{2}}$
E. $4\sqrt{2}$

xii. Which of the following is the vulgar fraction of 2.232323. . . .?

A. $\frac{22}{99}$ B. $\frac{222}{99}$
C. $\frac{221}{99}$ D. $\frac{211}{99}$
E. $\frac{223}{99}$

xiii. What are the first four terms of the sequence $a_n = (-1)^n n^2$?

A. 0, –1, 4, –9 B. –1, 4, –9, 16
C. 1, –4, 9, –16 D. 1, 4, 9, 16
E. –1, –4, –9, –16

xiv. What is the value of $\frac{8!}{6!}$?

A. 56 B. 55
C. 61 D. 76
E. 86

xv. For what value of n, ${}^{n}P_2 = 30$.

A. 5 B. 6
C. –5 D. 10
E. 15

xvi. Which one of the following is the sixth term from the end in the expansion of $\left(\frac{3x}{2} - \frac{1}{3x}\right)^{11}$?

A. 5th term B. 7th term
C. 4th term D. 8th term
E. 6th term

xvii. For what least value of n, the expression $4^n > 3^n + 2^{n-1}$ is true when $n \in Z^+$.

A. $n = 4$ B. $n = 3$
C. $n = 2$ D. $n = 1$
E. $n = 5$

xviii. Which one of the following is an expansion of $(1+x)^{-1}$?

A. $1 - x + x^2 - x^3 + \ldots$ B. $1 + x - x^2 + x^3 + \ldots$
C. $1 + x + x^2 + x^3 + \ldots$ D. $1 - x - x^2 - x^3 + \ldots$
E. $-1 + x - x^2 + x^3 + \ldots$

xix. Which of the following is the simplified form of $\frac{1}{1+\sin\theta} + \frac{1}{1-\sin\theta}$?

A. $\sec\theta$ B. $\sec^2\theta$
C. $2\sec^2\theta$ D. $2\text{cec}^2\theta$
E. $2\sec\theta$

xx. For what value of $\text{Sin}\,\theta$, $\tan\theta = \frac{8}{15}$, when terminal ray of θ lies is in first quadrant?

A. $\frac{-8}{17}$ B. $\frac{17}{8}$
C. $\frac{8}{17}$ D. $\frac{-17}{8}$
E. $\frac{9}{17}$

xxi. Which of the following is the simplified form of $\frac{\sin 2\theta}{\sin\theta} + \frac{\cos 2\theta}{\cos\theta}$?

A. $\cot\theta$ B. 0
C. -1 D. $\sec\theta$
E. $\csc\theta$

xxii. Which of the following can be replaced by $\sin\theta$?

A. $2\sin\theta\ \cos\theta$ B. $2\sin\left(\frac{\theta}{2}\right)\cos\left(\frac{\theta}{2}\right)$
C. $2\sin\left(\frac{\theta}{2}\right)\sin\left(\frac{\theta}{2}\right)$ D. $\sin\left(\frac{\theta}{2}\right)\cos\left(\frac{\theta}{2}\right)$
E. $2\cos^2\frac{\theta}{2}$

xxiii. What is the period of a function $y = \sec x$?

A. 2π B. π

C. 3π D. $\frac{2\pi}{3}$

E. $\frac{\pi}{2}$

xxiv. What is the range of a function $y = 2 \sin x$?

A. $-2 < y < 2$ B. $-2 \leq y \leq 2$

C. $-2 < y \leq 2$ D. $-2 \leq y < 2$

E. $-1 \leq y \leq 2$

xxv. In a triangle *ABC*, what will be the e-radius corresponding to angle *B*?

A. $\frac{\Delta}{s-a}$ B. $\frac{\Delta}{s-b}$

C. $\frac{\Delta}{s-c}$ D. $\frac{\Delta}{s}$

E. $\frac{s-a}{\Delta}$

xxvi. What is the name given to the point of intersection of angle bisectors of a triangle?

A. *in – centre* B. *circum – centre*

C. *orthocenter* D. *centroid*

E. *e – centre*

xxvii. What will be the domain for $y = \sin^{-1}x$?

A. $-1 < x < 1$ B. $-1 \leq x \leq 1$

C. $\frac{-\pi}{2} < x \leq \frac{\pi}{2}$ D. $\frac{-\pi}{2} \leq x < \frac{\pi}{2}$

E. $\frac{-\pi}{2} \leq x \leq \frac{\pi}{2}$

xxviii. What is the value of $Sec[Sin^{-1}\left(-\frac{1}{2}\right)]$?

A. $\frac{2}{\sqrt{3}}$ B. $\frac{-2}{\sqrt{3}}$

C. $\frac{1}{2}$ D. $-\frac{1}{2}$

E. $\sqrt{3}$

xxix. Which of the following is not a solution of equation $\cos x = \frac{1}{2}$?

A. $x = \frac{\pi}{3}$ B. $x = \frac{5\pi}{3}$

C. $x = \frac{4\pi}{3}$ D. $x = \frac{7\pi}{3}$

E. $x = -\frac{\pi}{3}$

xxx. Which one is the solution set of $\text{Sin}\, x = \frac{1}{2}$ where $x \in [0, 2\pi]$?

A. $\left\{\frac{\pi}{6}, \frac{\pi}{2}\right\}$ B. $\left\{\frac{5\pi}{6}, \frac{3\pi}{2}\right\}$

C. $\left\{\frac{\pi}{6}, \frac{5\pi}{6}\right\}$ D. $\left\{\frac{\pi}{3}, \frac{5\pi}{3}\right\}$

E. $\left\{\frac{\pi}{4}, \frac{3\pi}{4}\right\}$

For Examiner's use only

Q. No.1: Total Marks:	20
Marks Obtained:	

Federal Board HSSC-I Examination
Mathematics Model Question Paper

Time allowed: 2.30 hours Total Marks: 80

Note: Sections 'B' and 'C' comprise pages 1-2 and questions therein are to be answered 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 × 4 = 40)

i. Show that $z \in C, z^2 - \bar{z}^2$ is an imaginary number.

ii. Construct the truth table of $\sim(p \to q) \leftrightarrow (p \wedge \sim q)$

iii. Show that $\begin{vmatrix} b+c & a & a \\ b & c+a & b \\ c & c & a+b \end{vmatrix} = 4abc$

iv. Show that $(1+w)(1+w^2)(1+w^4)(1+w^8)\ldots.$ 2*n* factors = 1

v. Resolve into Partial Fractions: $4x/\big((x+1)^2(x-1)\big)$

vi. The sum of three number in A.P is 24 and their product is 440. Find the numbers.

vii. Find the numbers greater than 23000 that can be formed from the digits 1, 2, 3, 5, 6, without repeating any digit.

viii. Using binominal theorem, expand $(a+2b)^5$

ix. With usual notations show that $l = r\theta$

x. Show that $\cos 3a = 4\cos^3 a - 3\cos a$

xi. The sides of a triangle are $x^2 + x + 1,\ 2x + 1,\ 2x + 1$ and $x^2 - 1$. Prove that greatest angle of the triangle is 120°.

xii. Prove that $tan^{-1}\frac{1}{11} + tan^{-1}\frac{5}{6} = tan^{-1}\frac{1}{3} + tan^{-1}\frac{1}{2}$.

xiii. Draw the graph of $y = 2\cos x$ for the interval $[0, \pi]$

xiv. Solve the equation $1 + \cos x = 0$

SECTION – C (Marks 40)

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

Q.3 Find the value of λ so that system of equations have nontrivial solution. Also find the solution for the value of λ

$$x + y + z = 0$$
$$2x + y - \lambda z = 0$$
$$x + 2y - 2z = 0$$

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

Q.5 If $y = 1 + 2x + 4x^2 + 8x^3 + \ldots$ then show that $x = \frac{y-1}{2y}$ and also find the interval in which the series is convergent.

Q.6 If x is so small that its square and higher powers can be neglected, then show that

$$\frac{\sqrt{4+x}}{(1-x)^3} \approx 2 + \frac{25}{4}x$$

Q.7 Prove that in an equilateral triangle ABC, $r : R : r_1 = 1 : 2 : 3$

Q.8 Solve the equation $\sin^2 x + \cos x = 1$

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

MATHEMATICS
HSSC-I

SECTION-A (Q.1)

Maximum Marks	=	20
Syllabus	=	Chapter 1 to 14

SECTION-B (Q.2)

Maximum Marks	=	40	
Weightage	=	$\frac{10}{14}$	$(4 \times 10 = 40\ Marks)$

SECTION-C (Q.3 – 9)

Maximum Marks	=	40	
Weightage	=	$\frac{5}{7}$	$(8 \times 5 = 40\ Marks)$
Syllabus	=	Chapter 1 to 14	