Version No.			

ROLL NUMBER						

Answer Sheet No._____

Sign. of Candidate _____

Sign. of Invigilator _____

MATHEMATICS HSSC–I (2nd Set)

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.**

Q.1 Fill the relevant bubble for each part. All parts carry one mark.

(1) If $\frac{2}{1-i} - x = 0$, then value of x is:

A. $-1 - i$ ◯ B. $-1 + i$ ◯

C. $1 - i$ ◯ D. $1 + i$ ◯

(2) If A and B are two sets and $A \cap B = \phi$, then $n(A \cup B)$ is:

A. $n(A) + n(B)$ ◯ B. $n(A)$ ◯

C. $n(B)$ ◯ D. $n(A) + n(B) - n(A \cap B)$ ◯

(3) If $\begin{bmatrix} 1 & 2 \\ 3 & 4 \\ 5 & 6 \end{bmatrix} X = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$ then what is the order of matrix X?

A. 2×2 ◯ B. 2×3 ◯

C. 3×2 ◯ D. 3×3 ◯

(4) If $x^3 + 3x^2 - 6x + 2$ is divided by $x + 2$, then the remainder is:

A. -18 ◯ B. 9 ◯

C. -9 ◯ D. 18 ◯

(5) If α, β are the roots of the equation $3x^2 - 2x - 9 = 0$, then $(\alpha + 1)(\beta + 1)$ is:

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

C. $-\frac{1}{3}$ ◯ D. $\frac{1}{3}$ ◯

(6) For how many values of x, the expression $x^2 - x - 2 = (x + 1)(x - 2)$ holds?

A. For no value of x ◯

B. For only one value of x ◯

C. For only two values of x ◯

D. For all values of x ◯

(7) The series $1 + \frac{x}{2} + \frac{x^2}{2} + \cdots$ is convergent if:

A. $x \in R$ ◯ B. $x \in [-2, 2]$ ◯

C. $x \in (-2, 2)$ ◯ D. $x \in Z$ ◯

(8) Which of the following series represents $\sum_{n=1} 6(3)^{n-1}$?

A. $6 + 9 + 12 + \cdots$ ◯ B. $6 + 18 + 54 + \cdots$ ◯

C. $3 + 9 + 27 + \cdots$ ◯ D. $6 + 12 + 18 + \cdots$ ◯

(9) The probability of getting a total of 10 in a single throw of two dice is:

A. $\frac{1}{9}$ ◯ B. $\frac{1}{12}$ ◯

C. $\frac{1}{6}$ ◯ D. $\frac{5}{36}$ ◯

(10) In how many ways can we choose a committee of 5 from 8 persons?

A. 56 ◯ B. 336 ◯

C. 6720 ◯ D. 6 ◯

(11) The middle term in the expansion of $(a + b)^6$ is:

A. T_3 ◯ B. T_4 ◯

C. T_5 ◯ D. T_6 ◯

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

A. $|x| > \frac{1}{2}$ ◯ B. $|x| > 1$ ◯

C. $|x| < \frac{1}{2}$ ◯ D. $|x| < 2$ ◯

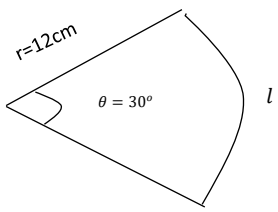
(13) What is the value of l in the adjoining figure?

A. π ◯

B. 2π ◯

C. 3π ◯

D. 4π ◯



(14) $sin294^o =$ _____.

A. $sin24^o$ ◯ B. $cos24^o$ ◯

C. $-sin24^o$ ◯ D. $-cos24^o$ ◯

(15) Which one of the following is equal to $\cos(\alpha + \beta)$ if $\alpha + \beta + \gamma = 180^o$?

A. $sin\gamma$ ◯ B. $cos\gamma$ ◯

C. $-cos\gamma$ ◯ D. $-sin\gamma$ ◯

(16) At what angle, the graph of $y = cos2x$ crosses x −axis?

A. $\frac{\pi}{4}$ ◯ B. $\frac{\pi}{2}$ ◯

C. π ◯ D. 0 ◯

(17) If $a = 2$, $b = 3$ and $\gamma = 30^o$, then triangular area is:

A. 1.5 ◯ B. 0.8 ◯

C. 2.6 ◯ D. 2.1 ◯

(18) Which one of the following is the simplified form of $\sqrt{rr_1r_2r_3}$ (With usual notations)?

A. Δ ◯ B. Δ^2 ◯

C. Δ^3 ◯ D. $\sqrt{\Delta}$ ◯

(19) The value of $\tan\left[cos^{-1}\left(\frac{1}{2}\right) - sin^{-1}\left(-\frac{1}{2}\right)\right]$ is:

A. 0 ◯ B. 0.5 ◯

C. undefined ◯ D. 1 ◯

(20) Solution set of $sinx = -\frac{\sqrt{3}}{2}$ is:

A. $\left\{\frac{4\pi}{3} + 2n\pi\right\} \cup \left\{\frac{5\pi}{3} + 2n\pi\right\}$ ◯

B. $\left\{\frac{\pi}{3} + 2n\pi\right\} \cup \left\{\frac{2\pi}{3} + 2n\pi\right\}$ ◯

C. $\left\{\frac{\pi}{3} + 2n\pi\right\} \cup \left\{\frac{4\pi}{3} + 2n\pi\right\}$ ◯

D. $\left\{\frac{\pi}{2} + 2n\pi\right\} \cup \left\{\frac{3\pi}{2} + 2n\pi\right\}$ ◯

Federal Board HSSC-I Examination
Mathematics Model Question Paper
(Curriculum 2000)

Time allowed: 2.35 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. Write your answers neatly and legibly.

SECTION – B (Marks 48)

Q.2 Attempt any **TWELVE** parts. All parts carry equal marks. (12 × 4 = 48)

i. If $= \sqrt{2} - i$, then show that
   a. $z^2 + \bar{z}^2$ is a real number. b. $(z - \bar{z})^2$ is a real number.

ii. Prove that $p \to q = \sim(p \wedge \sim q)$

iii. If $A = \begin{bmatrix} 1 & 2 & -1 \\ -3 & -2 & 2 \\ 1 & 2 & -3 \end{bmatrix}$, then find:
   a. A_{11} , A_{21} and A_{31} b. $|A|$

iv. Solve the system of equations: $y = 25x^2 - 9x + 2$; $y + 2 = 11x$

v. Show that the roots of $(x - p)(x - q) + (x - q)(x - r) + (x - r)(x - p) = 0$ are real and they cannot be equal unless $p = q = r$.

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

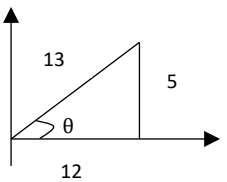
vii. If b, c, p, q, r are in A.P. then prove that $b + r = c + q = 2p$

viii. The pth term of an H.P. is q and the qth term is p. Find the $(pq)th$ term of H.P.

ix. Find the number of permutations of all the letters in the word "HOCKEY" such that
   a. the letters C and K are placed together.
   b. the letters C and K are not placed together.

x. If a be nearly equal to b, then prove that $\frac{b+2a}{a+2b}$ is nearly equal to $\sqrt[3]{\frac{a}{b}}$.

xi. In the given figure, prove that
   a. $\sec^2\theta - \tan^2\theta = 1$
   b. $cosec^2\theta - \cot^2\theta = 1$



xii. Deduce $tan(\alpha - \beta) = \frac{tan\alpha - tan\beta}{1 + tan\alpha tan\beta}$ from fundamental law of trigonometry.

xiii. Sketch the graph of $y = cos\left(\frac{\pi}{6}x\right)$ for $-4 \leq x \leq 4$.

xiv. Using Law of Cosines, prove that $\frac{cos\alpha}{a} + \frac{cos\beta}{b} + \frac{cos\gamma}{c} = \frac{a^2+b^2+c^2}{2abc}$ with usual notations.

xv. Prove that $4\tan^{-1}\frac{1}{5} - \tan^{-1}\frac{1}{239} = \frac{\pi}{4}$.

xvi. Solve $sinx + cosx = 1$ for all real values of x.

SECTION – C (Marks 32)

Note: Attempt any **FOUR** questions. All questions carry equal marks. (4 × 8 = 32)

Q.3 Solve the following system of linear equations by reducing its augmented matrix to the reduced echelon form

$$4x + 8y + z = 5$$
$$2x - 3y + 2z = -5$$
$$x + 7y - z = 10$$

Q.4 Find the conditions that one root of the equation $ax^2 + bx + c = 0, (a \neq 0)$ may be

i. three times the other
ii. square of the other.
iii. Additive inverse of the other
iv. multiplicative inverse of the other

Q.5 Show that $\left(2^{\frac{1}{4}}\right)\left(4^{\frac{1}{8}}\right)\left(8^{\frac{1}{16}}\right)\left(16^{\frac{1}{32}}\right) \ldots \infty = 2$

Q.6 Prove that $3^n + 2^{n-1} < 4^n$ by the principle of extended mathematical induction.

Q.7 Prove the following identities:

i. $sin3\theta + sin5\theta + sin7\theta + sin9\theta = 4cos\theta sin6\theta cos2\theta$
ii. $cos5\theta + cos\theta + 2cos3\theta = 4cos3\theta \cos^2\theta$

Q.8 A poster 4 feet high and 8 feet from the ground is being observed on a wall. If the observer is standing x feet from the wall and his eye is 5 feet from the ground level, then show that

$\theta = \tan^{-1}\left(\frac{4x}{x^2+21}\right)$.

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MATHEMATICS HSSC-I (2nd Set)

Student Learning Outcomes Alignment Chart

National Curriculum 2000

S#	Section: Q. No. (Part no.)	Contents and Scope	Student Learning Outcomes
1	A: 1(1)	Concept of Complex Numbers and Basic Operations on them Conjugate and its properties	To know the conjugate of a complex number; To know the additive and multiplicative identities of complex numbers and to find the additive and multiplicative inverses.
2	A:1(2)	Revision of the work done in the previous classes	Sets and their types; operations on sets and verification properties of operations on sets.
3	A: 1(3)	Revision of the work done in the previous classes	A matrix, its rows and columns and order of a matrix, conformability of addition and multiplication of matrices.
4	A: 1(4)	Application of Remainder Theorem in the Solution of Equations	To apply remainder theorem in finding one or two rational roots of cubic and quadratic equations
5	A: 1(5)	Relations between the Roots and Co-efficient of Quadratic Equations	To establish the relations between roots and coefficient of a quadratic equation and their applications.
6	A: 1(6)	Partial Fractions	To distinguish identities from conditional equations
7	A: 1(7)	Geometric Series	To establish the formulas for finding the sum of geometric series upto infinity
8	A: 1(8)	Geometric Series	To establish the formulas for finding the sum of geometric series upto infinity
9	A: 1(9)	Probability(Basic Concepts and Estimation of Probability)	To know the formula for finding the probability; To apply the formula for finding probability in simple cases
10	A: 1(10)	Permutations	To understand the meaning of permutation of n different things taken r at a time and know the notation ${}^{n}P_{r}$
11	A: 1(11)	Binomial Sequence for positive integral indices	To find the general term in the expansion of $(a+b)^n$ and find their particular terms (Without expansion)
12	A: 1(12)	Binomial Sequence for negative integral and rational indices	To state binomial theorem for rational indices and to find number of terms
13	A: 1(13)	Relation between the length of an arc of a circle and the circular measure of its central angle	To establish the rule $\theta = l/r$ where r is the radius of the circle, l is a length of the arc and θ is the circular measure of the central angle of arc
14	A: 1(14)	Trigonometric Ratios of Allied Angles	To find the trigonometric functions of the angles
15	A: 1(15)	Fundamental Formulas of Sum and Difference of Two Angles and their Application	To establish the formula: $\cos(\alpha-\beta) = cos\alpha cos\beta + sin\alpha sin\beta$ and its deduction
16	A: 1(16)	Graphs of Trigonometric Functions	To know that the graphs of the trigonometric functions are repeated depending upon the

			period of the functions
17	A: 1(17)	Areas of Triangular Regions	To establish and apply the formula for finding the area of the triangular region; $\Delta = \frac{1}{2}absin\gamma$
18	A: 1(18)	Radii of Circles connected with Triangles	To find the radii of b) In-cirlce c) Escribed circle of triangles and to solve problems involving these radii
19	A: 1(19)	Inverse Trigonometric Functions	To know the general and principle trigonometric functions, their inverses and their values
20	A: 1(20)	Solution of Trigonometric Equations	To solve trigonometric Equations and to make use of the period of trigonometric functions for finding the general solution of the equations
21	B: 2(i)	Concept of Complex Numbers and Basic Operations on them. Conjugate and its properties	To know four binary operation on complex numbers; To know the conjugate of the complex numbers
22	B: 2(ii)	Logical Proofs of the Operation on Sets	Introduction to the logical statements and their composition; Truth values and truth tables of logical statements and their logical equivalence
23	B: 2(iii)	Determinants and their Application in the study of the Algebra of the Matrices	Concept of a determinant of a square matrix expansion of the determinants upto order 4, to write minors and cofactors of the elements of a matrix
24	B: 2(iv)	Solution of a system of Two Equations	To solve a system of two equations, when a) one of them is linear and the other is quadratic in two variables
25	B: 2(v)	Relations between the Roots and Co-efficient of Quadratic Equations	To find the nature of the roots of a quadratic equation with rational coefficients.
26	B: 2(vi)	Partial Fractions	To reduce a fraction into partial fractions when its denominator consists of c) non-repeated quadratic factor
27	B: 2(vii)	Arithmetic Sequence	To solve problems pertaining to the terms of an A.P.
28	B: 2(viii)	Harmonic Sequence	To find the nth term of harmonic progression (H.P) and apply it in solving related problems
29	B: 2(ix)	Permutations	To establish formula for ${}^{n}P_{r}$ and apply it in solving problems of finding the number of arrangements of n things taken r at a time
30	B: 2(x)	Binomial Series	To be able to identify given series as a binomial expansion and hence find the sum of series
31	B: 2(xi)	Trigonometric Functions	To establish the following relations between the trigonometric ratios; $1 + \tan^2\theta = \sec^2\theta$ and $1 + \cot^2\theta = cosec^2\theta$ To be able to apply the above

			mentioned relations in b) proving the trigonometric identities
32	B: 2(xii)	Fundamental Formulas of Sum and Difference of Two Angles and their Application	To establish the formula: $\cos(\alpha - \beta) = cos\alpha cos\beta + sin\alpha sin\beta$ and deduction there from, for finding the sum and difference of the trigonometric ratios
33	B: 2(xiii)	Graphs of Trigonometric Functions	To draw the graphs of the six basic trigonometric functions.
34	B: 2(xiv)	Cosine Formula	To establish the cosine formula and apply it in the solution of oblique triangles
35	B: 2(xv)	Inverse Trigonometric Functions	Development of formulas for inverse trigonometric functions
36	B: 2(xvi)	Solution of Trigonometric Functions	To solve trigonometric Equations and to make use of the period of trigonometric functions for finding the general solution of the equations
37	C: 3	Solving Simultaneous Linear System of Equations	To be able to solve a system of linear non-homogeneous equations by the use of b) echelon and reduced echelon form
38	C: 4	Relations between the Roots and Co-efficient of Quadratic Equations	To establish the relations between roots and coefficient of a quadratic equation and their applications.
39	C: 5	Geometric Series	To establish the formulas for the sum of geometric sequence upto infinity
40	C: 6	Introduction and Application of Mathematical Induction	Principle of mathematical induction and its various applications
41	C: 7	Sum, Difference and Product of the Trigonometric Ratios	To find the formulas for the following $sin\alpha \pm sin\beta; cos\alpha \pm cos\beta$
42	C: 8	Heights and Distances	To be able to use solution of right triangles in solving the problems of heights and distances.

MATHEMATICS HSSC-I (2nd Set)

Table of Specification

Topics	1. Number Systems	2. Sets, Functions and Groups	3. Matrices and Determinants	4. Quadratic Equations	5. Partial Fractions	6. Sequences and Series	7. Permutation, Combination and Probability	8. Mathematical Inductions and Binomial Theorem	9. Fundamentals of Trigonometry	10. Trigonometric Identities	11. Fundamentals of Trigonometry	12. Application of Trigonometry	13. Inverse Trigonometric Functions	14. Solution of Trigonometric Equations	Total marks for each assessment objective	% age
Knowledge based	1i(1) 2i(4)	1ii(1) 2ii(4)		4(8) 2iv(2)	1vi(1) 2vi(4)		1ix(0.5) 1x(1)	1xi(1) 6(8) 2x(4)			2xiii(2)	1xvii(1)		1xx(1)	43.5	32.95%
Comprehension based			1iii(1) 2iii(4) 3(8)	2iv(2) 2v(4) 1v(1)		5(8) 1vii(1) 1viii(1) 2vii(4) 2viii(4)		1xii(1)		1xiv(1) 2xii(4) 7(8) 1xv(1)		1xviii(1)	2xv(4) 1xix(1)	2xvi(4)	63	47.73%
Application based				1iv(1)			2ix(4) 1ix(0.5)		2xi(4) 1xiii(1)		1xvi(1) 2xiii(2)	8(8) 2xiv(4)			25.5	19.32%
Total marks for each topic	05	05	13	18	05	18	6	14	05	14	05	14	05	05	132	100%

KEY:

1(1)(01)
Question No (Part No.) (Allocated Marks)

Note: (i) The policy of FBISE for knowledge based questions, understanding based questions and application based questions is approximately as follows:

a) 30% knowledge based.
b) 50% understanding based.
c) 20% application based.

(ii) The total marks specified for each unit/content in the table of specification is only related to this model question paper.

(iii) The level of difficulty of the paper is approximately as follows:

a) 40% easy
b) 40% moderate
c) 20% difficult