

**FEDERAL BOARD OF INTERMEDIATE AND  
SECONDARY EDUCATION  
H-8/4, ISLAMABAD**



No.1-2/FBISE/RES/CC/391

22 June, 2023

**NOTIFICATION**

It is notified for information of all concerned that curriculum 2006 is hereby implemented in the subject of Mathematics at HSSC level w.e.f. the session 2023-25 and onwards. Thereby the students to be admitted in class-XI in 2023 and subsequently to be promoted to class-XII in 2024 shall be examined in accordance with the SLOs of the curriculum 2006, in HSSC Part-I Annual Examination 2024 and HSSC Part-II Annual Examination 2025 respectively. Curriculum 2006 has been uploaded on the FBISE weblink [https://www.fbise.edu.pk/curriculum\\_model\\_paper.php](https://www.fbise.edu.pk/curriculum_model_paper.php). The textbooks published by KPK Textbook Board, Balochistan Textbook Board and Sindh Textbook Board are recommended as reference books.

2. Model Question Paper based on Curriculum 2006 for class XI is also being uploaded on the FBISE website.

(MIRZA ALI)

Director (Research and Academics)

Ph: 051-9269504

Email: [director@fbise.edu.pk](mailto:director@fbise.edu.pk)

Heads of Institutions affiliated with FBISE at HSSC Level

**Copy to:**

1. Director General, Federal Directorate of Education, G-9/4, Islamabad
2. Director General, FGEI (C&G) Directorate, Sir Syed Road, Rawalpindi Cantt.
3. Assistant Chief of the Air Staff (Education), PAF Air Headquarters, Peshawar
4. Director Education, Directorate of Naval Educational Services, Naval HQ, Islamabad
5. Director, Army Public Schools and Colleges System Secretariat, GHQ, Rawalpindi
6. Director, CB Education Directorate, C/o Chaklala Cantonment Board, Rawalpindi
7. Director (Education), Fauji Foundation Head Office, Welfare Division, Chaklala, Rawalpindi
8. Director General, OPF Head Office, Sector G-5, Islamabad
9. Director Education, Kahuta Research Laboratory (KRL), Kahuta, District Rawalpindi
10. Ms Oneeza Amber Asif, HOD/Senior Manager Education, Fauji Foundation Head Office, Welfare Division, Chaklala, Rawalpindi
11. Mr. Muhammd Ashraf Hiraj, Principal, Startwell Education House No.9, Main Khayban-e-Tanveer Chaklala Scheme-III, Rawalpindi Cantt
12. Mrs. Sakina Fowad Bukhari, Principal, City Lyceum School House No.394 St.No.4, Gulraiz-3 near Madina Mall, High Court Road, Rawalpindi
13. The Director, Punjab Group of Colleges, 6<sup>th</sup> Road, Rawalpindi
14. Brig Dr. Muhammad Hanif (R) SI (M), Principal, Dr A Q Khan College of Science & Technology, Bahria Town, Phase 8, Islamabad
15. All HODs, FBISE, Islamabad
16. Director IT (with the request to upload the same on FBISE website and Social Media)
17. Incharge, FBISE, Sub-Office, Gilgit
18. Incharge, FBISE Sub-Office, Skardu
19. APS to Chairman, FBISE, Islamabad
20. APS to Secretary, FBISE, Islamabad
21. Chat Room, FBISE, Islamabad

Version No.			

ROLL NUMBER						



0	0	0	0
1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7
8	8	8	8
9	9	9	9

0	0	0	0	0	0	0
1	1	1	1	1	1	1
2	2	2	2	2	2	2
3	3	3	3	3	3	3
4	4	4	4	4	4	4
5	5	5	5	5	5	5
6	6	6	6	6	6	6
7	7	7	7	7	7	7
8	8	8	8	8	8	8
9	9	9	9	9	9	9

Answer Sheet No. \_\_\_\_\_

Sign. of Candidate \_\_\_\_\_

Sign. of Invigilator \_\_\_\_\_

**MODEL QUESTION PAPER (SET – I)**  
**MATHEMATICS HSSC–I (Based on Curriculum 2006)**

**SECTION – A (Marks 20)**  
**Time allowed: 25 Minutes**

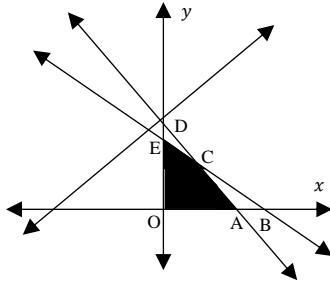
Section – A is compulsory and comprises pages 1-2. All parts of this section are to be answered on the question papers itself. It should be completed in the first 25 minutes and handed over to the Centre Superintendent. Deleting/overwriting is not allowed. **Do not use lead pencil.**

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

- (1) Complex number  $\frac{1}{(2-i)^2}$ , in the form  $a + ib$  is:
- A)  $\frac{3}{25} + \frac{4}{25}i$        B)  $\frac{3}{25} - \frac{4}{25}i$    
 C)  $-\frac{4}{25} - \frac{3}{25}i$        D)  $\frac{4}{25} - \frac{3}{25}i$
- (2) What is the conjugate of  $(1 + i)^3$ ?
- A)  $-2 + 2i$        B)  $-2 - 2i$    
 C)  $2 + 2i$        D)  $2 - 2i$
- (3) For what value of  $k$ ,  $\begin{vmatrix} 2 & -1 & k \\ 3 & 1 & 2 \\ -1 & 3 & -2 \end{vmatrix} = 0$ ?
- A)  $-2$        B)  $0$    
 C)  $1.2$        D)  $2$
- (4) What is the row rank of a matrix  $\begin{bmatrix} 1 & 3 & 5 \\ 4 & 5 & 5 \\ 1 & 2 & 2 \end{bmatrix}$ ?
- A)  $0$        B)  $1$    
 C)  $2$        D)  $3$

- (5) For what value of  $h$ , vectors  $\underline{a} = 3\underline{i} + \underline{j} - \underline{k}$  and  $\underline{b} = h\underline{i} - 4\underline{j} + 4\underline{k}$  are parallel ?
- A)  $-12$   B)  $4$    
 C)  $8$   D)  $12$
- (6) What is the angle between two non-zero vectors  $\underline{a}$  and  $\underline{b}$ , if  $|\underline{a} \times \underline{b}| = 5$  and  $\underline{a} \cdot \underline{b} = 5\sqrt{2}$ ?
- A)  $30^\circ$   B)  $45^\circ$    
 C)  $60^\circ$   D)  $90^\circ$
- (7) If  $a_n = 5n + 1$ , then sum of  $n$ -terms of the series is:
- A)  $\frac{n}{2}$   B)  $\frac{n}{2}(7 + 3n)$    
 C)  $\frac{n}{2}(7 + 4n)$   D)  $\frac{n}{2}(7 + 5n)$
- (8) If the Harmonic Mean of 30 and  $y$  is 24, then value of  $y$  is:
- A)  $20$   B)  $30$    
 C)  $40$   D)  $50$
- (9) The sum of first three terms of a series  $\sum_{r=6}^{100} (r - 2)^2$  is:
- A)  $2$   B)  $5$    
 C)  $15$   D)  $77$
- (10) In how many ways, 5 friends can be seated at a round table?
- A)  $5!$   B)  $4!$    
 C)  $C_2^5$   D)  $P_1^5$
- (11) What will be the probability of losing a game if the winning probability is 0.3?
- A)  $0.5$   B)  $0.6$    
 C)  $0.7$   D)  $0.8$
- (12) Which of the following is a correct option for the validity of  $(3 - 5x)^{-1/2}$ ?
- A)  $|x| < 5$   B)  $|x| < \frac{5}{3}$    
 C)  $|5x| < 1$   D)  $|x| < \frac{3}{5}$
- (13) If  $f(x) = \frac{5}{x+3}$ , then domain of  $f^{-1}(x)$  is:
- A)  $\mathcal{R}$   B)  $\mathcal{R} - \{0\}$    
 C)  $\mathcal{R} - \{-3\}$   D)  $\mathcal{R} - \{3\}$

(14) Which of the following are the corner points of the feasible region shown?



- |                       |                       |                    |                       |
|-----------------------|-----------------------|--------------------|-----------------------|
| A) $O, A, B, C, D, E$ | <input type="radio"/> | B) $O, A, C, E$    | <input type="radio"/> |
| C) $A, C, E$          | <input type="radio"/> | D) $A, B, C, D, E$ | <input type="radio"/> |

(15) If  $\alpha + \beta + \gamma = 180^\circ$  then  $\operatorname{cosec} \alpha (\cos \beta \cos \gamma - \sin \beta \sin \gamma)$  is equal to:

- |                   |                       |                  |                       |
|-------------------|-----------------------|------------------|-----------------------|
| A) $-\cot \alpha$ | <input type="radio"/> | B) $\tan \alpha$ | <input type="radio"/> |
| C) $\cot \alpha$  | <input type="radio"/> | D) $\csc \alpha$ | <input type="radio"/> |

(16) Which of the following represents  $2 \cos 75^\circ \cos 15^\circ$ ?

- |                                |                       |                         |                       |
|--------------------------------|-----------------------|-------------------------|-----------------------|
| A) $\frac{\sqrt{3}}{\sqrt{2}}$ | <input type="radio"/> | B) $\frac{1}{\sqrt{2}}$ | <input type="radio"/> |
| C) $\frac{1}{2}$               | <input type="radio"/> | D) $\frac{\sqrt{3}}{2}$ | <input type="radio"/> |

(17) Which of the following represents  $\left(\sin \frac{\alpha}{2}\right) \left(\cos \frac{\alpha}{2}\right)$ ?

- |                         |                       |                         |                       |
|-------------------------|-----------------------|-------------------------|-----------------------|
| A) $\frac{\Delta}{a^3}$ | <input type="radio"/> | B) $\frac{\Delta}{ac}$  | <input type="radio"/> |
| C) $\frac{\Delta}{bc}$  | <input type="radio"/> | D) $\frac{\Delta}{abc}$ | <input type="radio"/> |

(18) In triangle ABC (with usual notations) if  $a = \sqrt{3}$ ,  $b = 3$  and  $\beta = 60^\circ$ , then value of  $\alpha$  is:

- |               |                       |               |                       |
|---------------|-----------------------|---------------|-----------------------|
| A) $30^\circ$ | <input type="radio"/> | B) $45^\circ$ | <input type="radio"/> |
| C) $60^\circ$ | <input type="radio"/> | D) $75^\circ$ | <input type="radio"/> |

(19) Period of  $\tan 3\theta$  is same as that of:

- |                   |                       |                   |                       |
|-------------------|-----------------------|-------------------|-----------------------|
| A) $\sec 3\theta$ | <input type="radio"/> | B) $\cot 6\theta$ | <input type="radio"/> |
| C) $\sin 6\theta$ | <input type="radio"/> | D) $\tan 9\theta$ | <input type="radio"/> |

(20) What is the range of a trigonometric function  $y = -4 + 2\sin(3x + 5)$ ?

- |               |                       |               |                       |
|---------------|-----------------------|---------------|-----------------------|
| A) $[-2, -6]$ | <input type="radio"/> | B) $[-4, 2]$  | <input type="radio"/> |
| C) $[-4, 5]$  | <input type="radio"/> | D) $[-6, -2]$ | <input type="radio"/> |



Federal Board HSSC-I Examination  
**MATHEMATICS MODEL QUESTION PAPER**  
(Based on Curriculum 2006)

Time allowed: 2:35 hours

Total Marks Section B and C: 80

---

Note: Section 'B' and 'C' comprise pages 1-2 and questions therein are to be answered on the separately provided E-Sheets. Write your answers neatly and give the answer in the given space.

---

**SECTION – B (Marks 48)**

**Q2.** Attempt any **TWELVE** parts. All parts carry equal marks. (12 × 4 = 48)

- (i) Solve the following simultaneous linear equations with complex coefficients.  
 $3x - (2 + i)y = i + 7$  ;  $(2i - 1)x + (3i - 2)y = 2i + 1$
- (ii) Factorize  $z^3 + 6z^2 + 21z + 26 = 0$  to find  
a) One factor in the set of Real numbers and  
b) Two factors in the set of complex numbers
- (iii) Find inverse of the square matrix  $\begin{bmatrix} 2 & -1 & 3 \\ -1 & 2 & 3 \\ 1 & -1 & 2 \end{bmatrix}$ .
- (iv) Find angle between two vectors  $\underline{a} = 2\underline{i} - \underline{j} + 5\underline{k}$  and  $\underline{b} = 3\underline{i} + \underline{j} - \underline{k}$
- (v) The harmonic mean between two numbers is  $\frac{24}{5}$  and the geometric mean is 6. What are the numbers?
- (vi) Sum the series  $1 \cdot 2^1 + 3 \cdot 2^2 + 5 \cdot 2^3 + 7 \cdot 2^4 + \dots + 99 \cdot 2^{50}$ .
- (vii) If  $5 \times P_3^n = 4 \times P_3^{n+1}$ , find the value of  $n$ .
- (viii) In a factory, there are 100 units of a certain product, 5 of which are defective. If 3 units are selected from the 100 units at random, then what is the probability that none of them are defective?
- (ix) Using Principle of Mathematical Induction, prove that  $n^2 \geq 3n + 5$  for all positive integers  $n \geq 5$ .
- (x) Find an equation of a parabola of the form  $ax^2 + bx + c = 0$ , which crosses  $x$ -axis at  $(-8, 0)$  and  $(4, 0)$  and a point  $(-2, -6)$  lies on it.
- (xi) Graph the feasible region subject to the following constraints  
 $6x - 8y \leq 12$  ;  $3x + 4y \geq 6$  ;  $x \geq 0$  ;  $y \geq 0$
- (xii) Prove that  $\cos 5\theta + 2 \cos 3\theta + \cos \theta = 4 \cos^2 \theta \cos 3\theta$
- (xiii) Find area of a triangle ABC (with usual notations) if:  
(a)  $\alpha = 65^\circ$ ,  $b = 25$ ,  $c = 32$   
(b)  $a = 18$ ,  $\beta = 40^\circ$ ,  $\gamma = 55^\circ$
- (xiv) In triangle ABC (with usual notations), prove that  $\frac{s^2}{c} \left[ \tan \frac{\alpha}{2} + \tan \frac{\beta}{2} \right] \left[ \tan \frac{\alpha}{2} \tan \frac{\beta}{2} \right] = (s - c) \cot \frac{\gamma}{2}$
- (xv) Prove that  $\cot^{-1} \left( \frac{1}{3} \right) - 2 \tan^{-1} \left( \frac{2}{3} \right) = \cot^{-1} \left( \frac{41}{3} \right)$
- (xvi) Solve:  $2 \cos^4 x - 9 \cos^2 x + 4 = 0$  where  $x \in [0, 2\pi]$

## SECTION – C (Marks 32)

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

- Q3. Solve the following system of non-homogeneous linear equations using Gauss-Jordan method.  
 $x + 5y + 3z = 7$  ;  $2x + 3y + z = 6$  ;  $3x - 2y + 2z = -3$
- Q4. The sum of  $n$  terms of an arithmetic series is  $7n^2 + 8n$ .
- Find first term of the series.
  - Find common difference of the series.
  - Develop an arithmetic progression.
  - Find 15<sup>th</sup> term of the arithmetic progression.
- Q5. If  $x$  is so small that its square and higher powers can be neglected, then show that  
$$\frac{(1+x)^{\frac{3}{2}}(4-5x)^{\frac{1}{2}}}{(9+x)^{\frac{5}{2}}} \approx \frac{2}{243} \left(1 + \frac{43}{72}x\right)$$
- Q6. Find the maximum and minimum value of the function  $f(x, y) = x + 3y$ , subject to the following constraints  
 $2x + y \geq 4$  ;  $2x + 3y \leq 12$  ;  $x + 2y \leq 16$  ;  $x \geq 0$  ;  $y \geq 0$
- Q7. Prove that  $\cos 24^\circ + \cos 48^\circ + \cos 96^\circ + \cos 168^\circ = \frac{1}{2}$ .
- Q8. Solve graphically, the trigonometric equation:  $\sin(2x) = -x$ , where  $x \in [0, 2\pi]$

\*\*\*\*\*

# MATHEMATICS HSSC-I

## Student Learning Outcomes

(National Curriculum 2006)

Sec-A	Q 1	Contents and Scope	Student Learning Outcomes *	Cognitive Level **	Allocated Marks
	i	1.1 Complex Numbers	(v) Define $z = a - ib$ as the complex conjugate of $z = a + ib$ .	K	1
	ii	1.1 Complex Numbers	(iv) Carryout basic operations on complex numbers.	U	1
	iii	2.5 Row and Column operations	(v) Use row operations to find the inverse and rank of a matrix.	U	1
	iv	2.3 Determinants	(iii) Define singular and non-singular matrices.	K	1
	v	3.5 Dot or Scalar Product 3.6 Cross or Vector Product	(viii) Use dot product to find the angle between two vectors. (viii) Use cross product to find the angle between two vectors.	U	1
	vi	3.1 Vectors in Plane	(iii) Give the following fundamental definition using geometrical representation: • parallel vectors	K	1
	vii	4.4 Arithmetic Series	(ii) Establish the formula to find the sum to $n$ terms of an arithmetic series.	U	1
	viii	4.9 Harmonic Mean	(i) Define a harmonic mean	K	1
	ix	5.2 Arithmetico-Geometric Series	(ii) Find sum to $n$ terms of the arithmetico-geometric series.	U	1
	x	6.2 Permutation	(v) Find the arrangement of different objects around a circle.	A	1
	xi	6.4 Probability	(ii) Recognize the formula for probability of occurrence of an event E, i.e. $P(E) = \frac{n(E)}{n(S)}, 0 \leq P(E) \leq 1$ .	A	1
	xii	7.3 Binomial Series	(ii) Expand $(1 + x)^n$ in ascending powers of $x$ and explain its validity or convergence for $ x  < 1$ where $n$ is a Rational number.	A	1
	xiii	8.2 Inverse Function	Define inverse functions and demonstrate their domain and range with examples.	U	1
	xiv	9.3 Feasible Region	(iii) Identify the feasible region of simple LP problems.	U	1
	xv	10.1 Fundamental Law of Trigonometry	Use distance formula to establish fundamental law of trigonometry: $\cos(\alpha - \beta) = \cos\alpha \cos\beta + \sin\alpha \sin\beta$ and deduce that $\cos(\alpha + \beta) = \cos\alpha \cos\beta - \sin\alpha \sin\beta$ , $\sin(\alpha \pm \beta) = \sin\alpha \cos\beta \pm \cos\alpha \sin\beta$ .	A	1
	xvi	10.4 Sum, Difference and Product of sine and cosine	(i) Express the product (of sines and cosines) as sums or differences (of sines and cosines).	U	1
	xvii	11.1 Solving Triangles	(ii) Define an oblique triangle and prove the law of cosines, the law of sines, the law of tangents and deduce respective half angle formulae.	K	1
	xviii	11.1 Solving Triangles	(iii) Apply above laws to solve oblique triangles.	K	1
	xix	12.1 Period of Trigonometric Functions	(iv) Find the maximum and minimum value of a given function of the type: • $a + b\sin\theta, a + b\cos\theta$ , • $a + b\sin(c\theta + d)$ , • $a + b\cos(c\theta + d)$ the reciprocals of above, where $a, b, c$ and $d$ are real numbers.	U	1
	xx	12.1 Period of Trigonometric Functions	(iii) Discuss the periodicity of trigonometric functions.	K	1
Sec-B	Q 2	Contents and Scope	Student Learning Outcomes *	Cognitive Level **	Allocated Marks
	i	1.3 Solution of equations	(iii) Solve quadratic equation of the form	K	4

			$pz^2 + qz + r = 0$ by completing squares, where $p, q, r$ are real numbers and $z$ a complex number.		
	ii	1.3 Solution of equations	(i) Solve the simultaneous linear equations with complex coefficients.	U	4
	iii	2.3 Determinants	(v) Use adjoint method to calculate inverse of a square matrix.	U	4
	iv	3.5 Dot or Scalar Product 3.6 Cross or Vector Product	(viii) Use dot product to find the angle between two vectors. (viii) Use cross product to find the angle between two vectors.	U	4
	v	4.6 Geometric Mean 4.9 Harmonic Mean	(i) Know geometric mean between two numbers. (i) Define a harmonic mean.	K	4
	vi	5.2 Arithmetico-Geometric Series	(ii) Find sum to $n$ terms of the Arithmetico-Geometric series.	U	4
	vii	6.4 Probability	(vii) Recognize the multiplication theorem (or law) of probability $P(A \cap B) = P(A)P(B A)$ or $P(A \cap B) = P(B)P(A B)$ where $P(B A)$ and $P(A B)$ are conditional probabilities. Deduce that $P(A \cap B) = P(A)P(B)$ where $A$ and $B$ are independent events.	A	4
	viii	6.2 Permutation	(iii) Prove that $P_r^n = n(n-1)(n-2) \dots n(n-r+1)$ and hence deduce that $P_r^n = \frac{n!}{(n-r)!}$ ; $P_n^n = n!$ ; $0! = 1$	U	4
	ix	7.1 Mathematical Induction	(ii) Apply the principle to prove the statements, identities or formulae.	A	4
	x	8.3 Graphical Representation of Functions	(v) Predict functions from their graphs (use the factor form to predict the equation of a function of the type $f(x) = ax^2 + bx + c$ , if two points where the graph crosses $x$ -axis and third point on the curve, are given).	A	4
	xi	9.3 Feasible Region	(ii) Define and show graphically the feasible region (or solution space) of an LP problem.	A	4
	xii	10.4 Sum, Difference and Product of sine and cosine	(ii) Express the sums or differences (of sines and cosines) as products (of sines and cosines).	U	4
	xiii	11.2 Area of a Triangle	Derive the formulae to find the area in terms of the measures of <ul style="list-style-type: none"> <li>two sides and their included angle,</li> <li>one side and two angles.</li> </ul>	U	4
	xiv	11.3 Circles Connected with Triangles	(ii) Derive the formulae to find <ul style="list-style-type: none"> <li>circum-radius,</li> <li>in-radius,</li> <li>escribed-radii,</li> </ul> and apply them to deduce different identities.	U	4
	xv	12.4 Inverse Trigonometric Functions	(v) Apply addition and subtraction formulae of inverse trigonometric functions to verify related identities.	A	4
	xvi	12.5 Solving General Trigonometric Equations	(i) Solve trigonometric equations and check their roots by substitution in the given trigonometric equations so as to discard extraneous roots.	A	4
<b>Sec-C</b>	<b>Q</b>	<b>Contents and Scope</b>	<b>Student Learning Outcomes *</b>	<b>Cognitive Level **</b>	<b>Allocated Marks</b>
	3	2.6 Solving System of Linear Equations	(iv) Solve a system of 3 by 3 non-homogeneous linear equations using Gauss-Jordan method (reduced echelon	A	8



			form).		
	4	4.2 Arithmetic Sequence 4.4 Arithmetic Series	(ii) Find the $n$ th or general term of an arithmetic sequence. (ii) Establish the formula to find the sum to $n$ terms of an arithmetic series.	K/U	8
	5	7.3 Binomial Series	(iii) Determine the approximate values of the binomial expansions having indices as –ve integers or fractions.	K/A	8
	6	9.4 Optimal Solution	(ii) Find optimal solution (graphical) through the following systematic procedure: Establish the mathematical formulation of LP problem, construct the graph, identify the feasible region, locate the solution points, evaluate the objective function, select the optimal solution and verify the optimal solution by actually substituting values of variables from the feasible region.	A	8
	7	10.4 Sum, Difference and Product of sine and cosine	(ii) Express the sums or differences (of sines and cosines) as products (of sines and cosines).	A	8
	8	12.3 Solving Trigonometric Equations Graphically	(ii) Solve graphically the trigonometric equations of the type $\sin\theta = \frac{\theta}{2}$ ; $\cos\theta = \theta$ ; $\tan\theta = 2\theta$ where $-\frac{\pi}{2} \leq \theta \leq \frac{\pi}{2}$	A	8

**\* Student Learning Outcomes**

National Curriculum for Mathematics Grades IX-XII, 2006

**\*\*Cognitive Level**      K: Knowledge              U: Understanding              A: Application