MATHEMATICS SSC–I (2nd Set)
(Science Group) (Curriculum 2006)
## SECTION – A (Marks 15)
Time allowed: 20 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)   What is resultant matrix when $\begin{bmatrix} 1 & -2 & 4 \\ 3 & 1 & 6 \\ 2 & 3 & 1 \end{bmatrix}$ is multiplied by 2?

A. $\begin{bmatrix} 2 & -2 & 4 \\ 6 & 1 & 6 \\ 4 & 3 & 1 \end{bmatrix}$ ◯   B. $\begin{bmatrix} 2 & -4 & 8 \\ 3 & 1 & 6 \\ 2 & 3 & 1 \end{bmatrix}$ ◯

C. $\begin{bmatrix} 2 & -2 & 4 \\ 3 & 2 & 6 \\ 2 & 3 & 2 \end{bmatrix}$ ◯   D. $\begin{bmatrix} 2 & -4 & 8 \\ 6 & 2 & 12 \\ 4 & 6 & 2 \end{bmatrix}$ ◯

(2)   The values of a and b in $\frac{2-3i}{i} = a - bi$.

A. $a = -3, b = -2$ ◯   B. $a = 3, b = 2$ ◯

C. $a = 3, b = 2$ ◯   D. $a = 3, b = -2$ ◯

(3)   Which one of the following represents the identity $x^3 - y^3$?
A. $(x - y)(x^2 + xy - y^2)$ ◯
B. $(x - y)(x^2 - xy - y^2)$ ◯
C. $(x - y)(x^2 - xy + y^2)$ ◯
D. $(x - y)(x^2 + xy + y^2)$ ◯

(4)   The factorized form of $12x^2 - 4x - 1$?
A. $(2x - 1)(6x + 1)$ ◯   B. $(2x + 1)(6x - 1)$ ◯
C. $(4x - 1)(3x - 1)$ ◯   D. $(4x - 1)(3x + 1)$ ◯

(5)   The solution of $\frac{x-5}{-7} < 3$ is :
A. $x > -16$ and $x = 16$ ◯
B. $x < -16$ and $x = -16$ ◯
C. $x < -16$ and $x = 16$ ◯
D. $x > -16$ and $x = -16$ ◯

(6) In the figure what is the mid point of $\overline{AB}$?

    A. $(\frac{7}{2}, -2)$ ◯

    B. $(-2, \frac{7}{2})$ ◯

    C. $(7, -4)$ ◯

    D. $(-4, 7)$ ◯
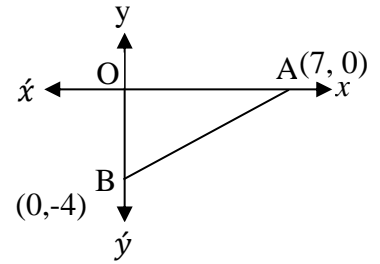
(7) The simplest form of $1 - \frac{2x-1}{x-3}$ is :

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

    C. $\frac{-x-4}{x-3}$ ◯   D. $\frac{x-4}{x-3}$ ◯

(8) The logarithmic form of $2^x = 32$ is:

    A. $\log_2 32 = x$ ◯   B. $\log_2 x = 32$ ◯

    C. $\log_{32} 2 = x$ ◯   D. $\log_x 32 = 2$ ◯

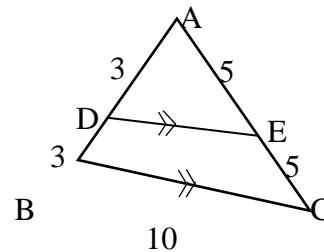(9) What is remainder when $x^3 - 3x^2 + x - 1$ is divided by $2x + 1$?

    A. $\frac{-19}{8}$ ◯   B. 0 ◯

    C. $\frac{3}{8}$ ◯   D. $\frac{-7}{8}$ ◯

(10) Which one of the following identifies right triangle BAC with a > b and a > c?

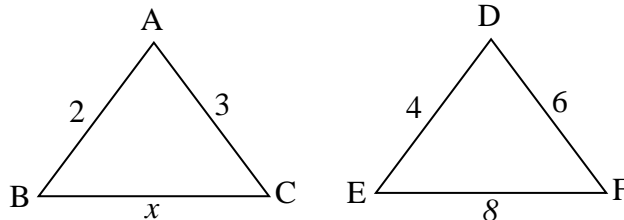   A. $c^2 = a^2 + b^2$ ◯   B. $a^2 = b^2 + c^2$ ◯

    C. $b^2 = a^2 + c^2$ ◯   D. $a^2 = b^2 - c^2$ ◯

(11) What is the value of $m\overline{DE}$?

    A.   5   ◯

    B.   5.5   ◯

    C.   6   ◯

    D.   6.5   ◯

(12) If $\Delta ABC \sim \Delta DEF$, then value of x is :

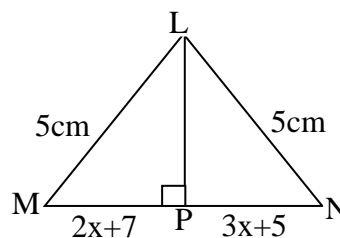   A.   4   ◯   B.   8   ◯

    C.   5   ◯   D.   1   ◯

(13) Which one of the following options is the solution of $|2x + 3| = -5$?

    A.   {4}   ◯   B.   {−4,1}   ◯

    C.   {4, 1}   ◯   D.   { }   ◯

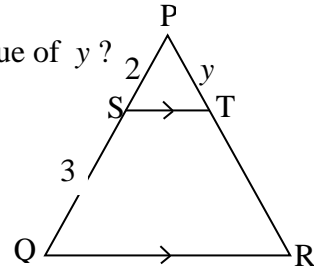(14) What is the length of $\overline{MN}$?

    A.   2   ◯

    B.   4   ◯

    C.   −2   ◯

    D.   12   ◯

(15) In the figure $\overline{ST} \parallel \overline{QR}$ and $m\overline{PR} = 10$. What is value of y ?

A. 15 ◯

B. 5 ◯

C. $\dfrac{20}{3}$ ◯

D. 4 ◯

Time allowed: 2.40 hours

Total Marks: 60

Note: Attempt any nine parts from Section 'B' and any three questions from Section 'C' on the separately provided answer book. Write your answers neatly and legibly. Log book will be provided on demand.

SECTION – B (Marks 36)

Q.2 Attempt any **NINE** parts from the following. All parts carry equal marks. (9×4 = 36)

i. Let A=$\begin{bmatrix} 0 & 2 \\ 3 & -1 \end{bmatrix}$, B=$\begin{bmatrix} -5 & -3 \\ 2 & 1 \end{bmatrix}$, C=$\begin{bmatrix} 3 & 1 \\ 1 & 2 \end{bmatrix}$. Verify that $A(BC) = (AB)C$

ii. Simplify using laws of logarithm $\dfrac{\sqrt[3]{46.34} \times (0.05)^2}{\sqrt{8.54}}$

iii. Simplify $\left(\dfrac{15m^3 n^{-2} p^{-1}}{25m^{-2} n^{-9}}\right)^{-3}$

iv. Find values of x and y if $(1+i)^3 (x+yi) = (4+5i)$

v. If $x - \dfrac{1}{x} = 7$ find value of $x^3 - \dfrac{1}{x^3}$

vi. If $x = -3 + \sqrt{2}$ find:

    a. $\dfrac{1}{x}$ b. $x + \dfrac{1}{x}$

    c. $x - \dfrac{1}{x}$ d. $x^2 + \dfrac{1}{x^2}$

vii. Find the square root of $4x^4 + 28x^3 + 49x^2 + 24x + 84 + \dfrac{36}{x^2}$.

viii. Find HCF of $x^2 + 4x - 12$, $x^2 - 4$ and $x^3 - 8$ by factorization.

ix. Factorize using factor theorem $P(x) = x^3 - 2x^2 - 5x + 6$

x. If one angle of a right triangle is $60°$, then hypotenuse is half as long as the side opposite to the angle. Prove it.

xi. Show that the points A(1, 1), B(3, 1) and C(4, 3) are vertices of right angle triangle.

xii. Prove that the sum of the lengths of any two sides of a triangle is greater than the length of the third side

xiii. Show that the points A(2, 4), B(4, 4), C(-1, 3) and D(-3, 3) are the vertices of a parallelogram.

xiv. If $2y - x - 3 = 0$
    a. make a table of values satisfying above equation
    b. Plot the pairs on graph

SECTION – C (Marks 24)

Note: Attempt any **THREE** questions. All questions carry equal marks. $(3\times 8 = 24)$

Q.3   Solve the following:

(a) $\left|\frac{x+8}{12}\right| = \frac{x-1}{5}$

(b) $2 \leq \frac{2}{3} - 4x < 3 - 5x$

Q.4   If three or more parallel lines make congruent intercepts on a transversal, they also intercept congruent segments on any other transversal.

Q.5   Price of a chair is Rs.3 more than half of price of a table. Also price of 3 chairs and one table is Rs.54. Find price of a chair and a table using matrix inversion method

Q.6   Prove that triangles on equal bases and of same altitudes are equal in area.

Q.7   If $\overline{AB} = 3cm$, $m\overline{AC} = 5.8$ and $m\angle B = 120°$ then
a.   Contruct ΔABC
b.   Draw altitudes of the sides
c.   Are altitudes concurrent?
         Also write down the steps of construction.

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MATHEMATICS SSC-I (2ⁿᵈ Set)

Student Learning Outcomes Alignment Chart

(Curriculum 2006)

Sec-A	Q1	Contents and Scope	Student Learning Outcomes
	1	1.3 Addition and Subtraction of Matrices	iii) Multiply a matrix by a real number.
	2	2.5 Complex Numbers	ii) Recognize a as real part and b as imaginary part of $z = a + ib$ iv) Know the condition for equality of complex numbers
	3	4.2 Algebraic Formulae	iv) Know the formula $a^3 \pm b^3 = (a \pm b)(a^2 \pm ab + b^2)$
	4	5.1 Factorization	• Factorize the expressions of the following types: Type III: $ax^2 + bx + c$
	5	7.4 Solving Linear Inequalities	Solve linear inequalities with rational coefficients.
	6	15.3 Mid-point Formula	i) Recognize the formula to find the midpoint of the line joining two given points.
	7	6.2 Basic Operations on Algebraic Fractions	Use highest common factor and least common multiple to reduce fractional expressions involving $+, -, \times, \div$.
	8	3.2 Logarithm	i) Define logarithm of a number to the base a as the power to which a must be raised to give the number (i.e. $a^x = y \Leftrightarrow \log_a y = x$, $a > 0$, $y > 0$ and $a \neq 1$).
	9	5.2 Remainder Theorem and Factor Theorem	ii) Find remainder (without dividing) when a polynomial is divided by a linear polynomial.
	10	22.1 Pythagoras' Theorem	Prove the following theorem along with corollaries and apply them to solve appropriate problems. i) "In a right-angled triangle, the square of the length of hypotenuse is equal to the sum of the squares of the lengths of the other two sides" to solve appropriate problems.
	11	18.1 Parallelograms and Triangles	iii) The line segment, joining the midpoints of two sides of a triangle, is parallel to the third side and is equal to one half of its length.
	12	21.1 Ratio and Proportion	iv) If two triangles are similar, the measures of their corresponding sides are proportional.
	13	7.2 Equation involving Absolute Value	ii) Solve the equation, involving variable.
	14	19.1 Line Bisectors and Angle Bisectors	ii) Any point equidistant from the points of a line segment is on the right bisector of it
	15	21.1 Ratio and Proportion	i) A line parallel to one side of a triangle, intersecting the other two sides, divides them proportionally.

Sec-B	i	Multiplication of matrices	iii. Verify associative law under multiplication
	ii	3.5 Application of Logarithm	Apply laws of logarithm to convert lengthy processes of multiplication, division and exponentiation into easier processes of addition and subtraction etc.
	iii	2.4 Laws of Exponents/Indices	ii) Apply the laws of exponents to simplify expressions with real exponents.
	iv	2.5 Complex Numbers	iv) Know the condition for equality of complex numbers.
	v	4.2 Algebraic Formulae	iii) Find the value of $x^3 \pm 1/x^3$ when the value of $x \pm 1/x$ is given.
	vi	4.3 Surds and their Application	ii) Explain the surds of second order. Use basic operations on surds of second order to rationalize the denominators and evaluate it.
	vii	6.3. Square Root of Algebraic Expression	Find square root of algebraic expression by division.
	viii	6.2 Basic Operations on Algebraic Fractions	Use Highest common factor and least common multiple to reduce fractional expressions involving $+, -, \times, \div$
	ix	5.3 Factorization of a Cubic Polynomial	Use factor theorem to factorize a cubic polynomial.
	x	17.1 Congruent triangles	ii) If two angles of a triangle are congruent, then the sides opposite to them are also congruent
	xi	15.2 Collinear Points	iii) Use distance formula to show that the given three non-collinear points form: • Right angled triangle.
	xii	20.1 Sides and Angles of a Triangle	iii) The sum of the lengths of any two sides of a triangle is greater than the length of the third side.
	xiii	15.2 Collinear Points	iv) Use distance formula to show that the given four non-collinear points form: • A parallelogram
	xiv	14.3. Graphic Solution of Equations in two Variables	Solve simultaneous linear equations in two variables using graphical method.
Sec-C	Q 3	7.2 Equations involving Absolute Value 7.4 Solving Linear Inequalities	ii) Solve the equation, involving absolute value, in one variable. Solve linear inequalities with rational coefficients.
	Q 4	18.1 Parallelograms and Triangles	v) If three or more parallel lines make congruent intercepts on a transversal they also intercept congruent segments on any other line that cuts them
	Q 5	1.6 Solution of Simultaneous Linear Equations	Solve a system of two linear equations and related real life problems in two unknowns using • Matrix inversion method.
	Q 6	23.1 Theorems related with area	iv). Triangles on equal bases and of same altitudes are equal in area

		29.1 Construction of Triangle	i) Construct a triangle having given: , • two of its sides and the angle opposite to one of them (ii) Draw : • altitudes, of a given triangle and verify their concurrency
	Q 7		

MATHEMATICS SSC-I
Table of Specification

Topics	1. Matrices and Determinants	2. Real and Complex Numbers	3. Logarithms	4. Algebraic Expressions & Algebraic Formulas	5. Factorization	6. Algebraic Manipulation	7. Linear Equations and Inequalities	8. Linear Graphs And Their Application	9. Introduction to Co-ordinate Geometry	10. Congruent Triangles	11 Parallelograms & Triangles	12. Line Bisectors & Angle Bisectors	13. Sides & Angles Of Triangle.	14. Ratio & Proportion	15. Pythagoras Theorem.	16. Theorems Related with Area	17. Practical Geometry - Triangles	Total marks for each assessment objective	% age
Knowledge based	1 i (1)	1ii (0.5)	1$viii$ (1)	1 iii (1) 2 v (4)	1 ix (1)	1 vii (1)		2 xiv (2)	2 xi (2)		4 (8)		2 xii (4)			6 (8)		33.5	30.2%
Understanding based	2 i (4)	1ii (0.5) 2 iv (4)		2 vi (4)	1 iv(1) 2 vii (4) 2 ix (4)	2 $viii$ (4)	1 v(1) 1$xiii$(1) 3 (8)		1 vi (0.5) 2 $xiii$ (4) 2 xi (2)					1xii(0.5) 1xv(1)			7 (8)	51.5	46.4%
Application based	5 (8)	2 iii (4)	2 ii (4)					2 xiv (2)	1 vi (0.5)	2 x (4)	1xi(1)	1xiv(1)		1xii(0.5)	1 x(1)			26	23.4%
Total marks for each topic	13	09	05	09	10	05	10	04	09	04	09	01	04	02	01	08	08	111	100%

KEY:

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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 30% knowledge based, 50% understanding based,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 40% easy, 40% moderate,20% difficult.