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

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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_____

MATHEMATICS SSC–I

(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) Which one of the following represents an identity matrix?

A. $\begin{bmatrix}1 & 0\\0 & 2\end{bmatrix}$ ◯ B. $\begin{bmatrix}2 & 0\\0 & 2\end{bmatrix}$ ◯

C. $\begin{bmatrix}1 & 1\\0 & 0\end{bmatrix}$ ◯ D. $\begin{bmatrix}1 & 0\\0 & 1\end{bmatrix}$ ◯

(2) Which one of the following options is the real part of $5i(3-2i)$?

A. –10 ◯ B. 10 ◯

C. 15 ◯ D. –5 ◯

(3) The scientific notation of 537.1 is:

A. 5.371×10^{2} ◯ B. 5.371×10^{3} ◯

C. 5.371×10^{-2} ◯ D. 5.371×10^{-3} ◯

(4) Which one of the following is a polynomial?

A. x^3+3x^2-5 ◯ B. $x^3+3x^{-2}-5$ ◯

C. $x^{3/2}+3x^2-5$ ◯ D. $x^2+3x^{-1/2}-5$ ◯

(5) The expansion of $(x-1)^3$ is:

A. x^3+3x^2-3x+1 ◯ B. x^3-3x^2+3x-1 ◯

C. x^3-3x^2-3x+1 ◯ D. x^3-3x^2-3x-1 ◯

(6) The multiplicative factors of $(2x^2-18)$ are:

A. $2(x-3)(x-3)$ ◯ B. $2(x-3)(x+3)$ ◯

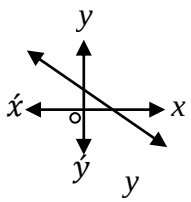
C. $(\sqrt{2}x-9)(\sqrt{2}x-9)$ ◯ D. $(\sqrt{2}x-9)(\sqrt{2}x+9)$ ◯

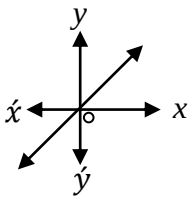
(7) Let a, b be real numbers, then a is greater than b if the difference $a - b$ is positive and we denote this order relation by the inequality:

A. $a > b$ ◯ B. $a < b$ ◯

C. $b \geq a$ ◯ D. $b \leq a$ ◯

(8) Which one of the following is a graph of $y = mx$?

A. 

◯ B. 

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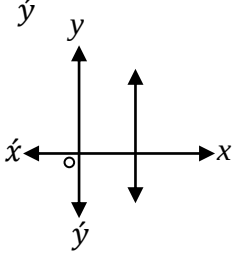
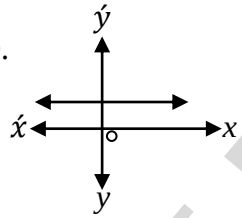
C. 

◯ D. 

◯

(9) The distance between the points $A\ (5,3)$ and $B\ (-5,7)$ is:

A. $10\sqrt{29}$ ◯ B. $4\sqrt{29}$ ◯

C. $8\sqrt{29}$ ◯ D. $2\sqrt{29}$ ◯

(10) Which one of the following points lies on the line $x - 2y + 1 = 0$?

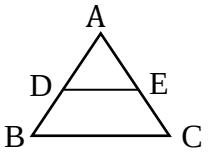
A. $(0, -1)$ ◯ B. $(-1,0)$ ◯

C. $(1,0)$ ◯ D. $(0,1)$ ◯

(11) In a given figure, If D and E are the mid points of the sides and $m\overline{DE} = 5cm$ then $m\overline{BC} = ?$

A. $5\ cm$ ◯ B. $10\ cm$ ◯

C. $15\ cm$ ◯ D. $2.5\ cm$ ◯



(12) What is the value of $|-a|$, where $a > 0$?

A. $-a$ ◯ B. $+a$ ◯

C. $-|a|$ ◯ D. $\sqrt{a}$ ◯

(13) Which one of the following side measures represents a right angled triangle?

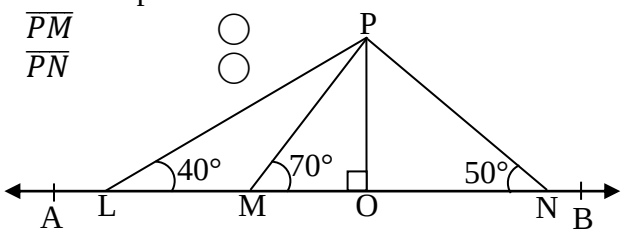
A. 1, 2, 3 ◯ B. 2, 3, 5 ◯

C. 2, 4, 7 ◯ D. 3, 4, 5 ◯

(14) In the figure given below, P is any point and AB is a line. Which one of the following is the shortest distance between the point P and the line AB?

A. $\overline{PO}$ ◯ B. $\overline{PM}$ ◯

C. $\overline{PL}$ ◯ D. $\overline{PN}$ ◯



(15) If P, Q and R are the collinear points then, which one of the following options is correct?

A. $|\overline{PQ}| + |\overline{QR}| = |\overline{PR}|$ ◯ B. $|\overline{PQ}|^2 + |\overline{QR}|^2 = |\overline{PR}|^2$ ◯

C. $|\overline{PQ}|^2 + |\overline{QR}|^2 \neq |\overline{PR}|^2$ ◯ D. $|\overline{PQ}| + |\overline{QR}| \neq |\overline{PR}|$ ◯

Federal Board SSC-I Examination
Mathematics Model Question Paper
(Science Group) (Curriculum 2006)

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. $(9\times4 = 36)$

i. If $\boldsymbol{A} = \begin{bmatrix} \frac{1}{4} & \frac{7}{2} \\ 2 & 2 \end{bmatrix}$

a. Find$|\boldsymbol{A}|$
b. Is matrix **A** non-singular?
c. Find $\boldsymbol{A^{-1}}$(multiplicative inverse)

ii. Simplify using laws of exponents $\frac{(x^{m+n})^2\times(x^{n+p})^2\times(x^{p+m})^2}{(x^{m+n+p})^3}$

iii. Simplify $\frac{2+6i}{3-i} - \frac{4-i}{3-i}$ and write answer in the form $a + bi$.

iv. If $x = \frac{\sqrt{5}+\sqrt{3}}{\sqrt{5}-\sqrt{3}}$, find

a. $\frac{1}{x}$ b. $x + \frac{1}{x}$ c. $x^3 + \frac{1}{x^3}$

v. Factorize $(x + 1)\ (x + 3)\ (x + 4)\ (x + 6) - 119$

vi. $f(x) = x^4 + 5x^3 - 8x^2 - 45x - 9$

a. Find the remainder when $f(x)$ is divided by $(x - 3)$.
b. Use the factor theorem to show that $(x + 3)$ is a factor of $f(x)$.

vii. Find HCF of the given polynomials by division method:

$3x^3 + 5x^2 - 6x - 2$; $3x^3 - 5x^2 + 6x - 4$

viii. Find the values of *l* and *m* for which the following expression $64x^4 + 153x^2 + 48x^3 + lx + m$ will become a perfect square.

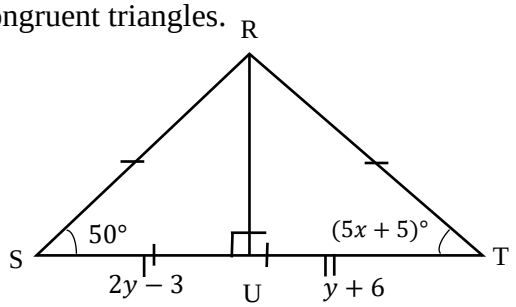
ix. Prove that, any point on the right bisector of a line segment is equidistant from its end points.

x. Solve for x: $\frac{3|x-5|}{2} - 8 = 12 - |x - 5|$

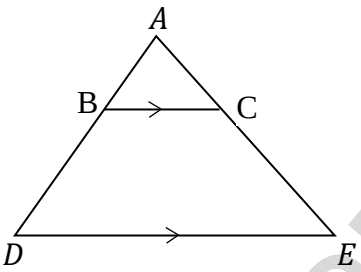
xi. Simplify: $\frac{a+b}{a^2+b^2} \cdot \frac{a}{a-b} \div \frac{(a+b)^2}{a^4-b^4}$

xii. Evaluate log 81 to base $\sqrt[3]{3}$.

xiii. Find the values of x and y for the given congruent triangles.



xiv. In the given figure $m\overline{AB} = 5cm, m\overline{BD} = 10cm, m\overline{AE} = 18cm$.
Find $m\overline{AC}$, if $\overline{BC} \| \overline{DE}$



SECTION – C (Marks 24)

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

Q3. If $A = \begin{bmatrix} 1 & 3 \\ 2 & 4 \end{bmatrix}$ and $B = \begin{bmatrix} 5 & 7 \\ 6 & 8 \end{bmatrix}$ then verify the following:
(a) $(AB)^t = B^t.A^t$ (b) $A.A^{-1} = A^{-1}.A$

Q4. Prove that 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.

Q5. Prove that parallelograms on the same base and lying between the same parallel lines (or of the same altitude) are equal in area.

Q.6 Find 'b' such that the points $A(2, b), B(5, 5)$ and $C\ (-6, 0)$ are vertices of a right angled triangle ABC with $m\angle BAC = 90°$.

Q7. If $m\overline{ZX} = 5cm,\ m\angle X = 75°$ and $m\angle Y = 45°$
a. Construct triangle XYZ.
b. Draw perpendicular bisectors of the three sides of triangle XYZ.
c. Are the perpendicular bisectors concurrent?

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MATHEMATICS SSC-I

Student Learning Outcomes Alignment Chart

(Curriculum 2006)

Sec-A	Q1	Contents and Scope	Student Learning Outcomes
	1	1.2 Types of Matrices	Define and identify row matrix, column matrix, rectangular matrix, square matrix, zero/null matrix, identity matrix, scalar matrix, diagonal matrix, transpose of a matrix, symmetric and skew-symmetric matrices.
	2	2.5 Complex Numbers 2.6 Basic Operations on Complex Numbers	ii) Recognize a as real part and b as imaginary part of $z = a + ib$. • Carryout basic operations (i.e. addition, subtraction, multiplication and division) on complex numbers.
	3	3.1 Scientific Notation	Express a number in standard form of scientific notation and vice versa.
	4	4.1 Algebraic Expressions	iii) Examine whether a given algebraic expression is a • polynomial or not, • rational expression or not.
	5	4.2 Algebraic Formulae	i) Know the formulas $(a + b)^3 = a^3 + 3ab(a+b) + b^3$ $(a - b)^3 = a^3 - 3ab(a-b) - b^3$ Find the value of $a^3 \pm b^3$ when the values of $a \pm b$ and ab are given.
	6	5.1 Factorization	Recall factorization of expressions of the following types. • $ka + kb + kc$ • $ac + ad + bc + bd$ • $a^2 \pm 2ab + b^2$ • $a^2 - b^2$ • $a^2 \pm 2ab + b^2 - c^2$
	7	7.3 Linear Inequalities	i) Define inequalities $(<, >)$, $(\leq, \geq)$.
	8	14.1Cartesian Plane and Linear Graphs	x) Draw the graph of • an equation of the form y = c . • an equation of the form x = a . • an equation of the form y = mx . • an equation of the form y = mx + c .
	9	15.1 Distance Formula	iii) Use distance formula to find distance between two given points.
	10	14.1 Cartesian plane and Linear Graph	vii) Construct a table for pairs of values satisfying a linear equation in two variables.
	11	18.1 Parallelograms and Triangles	Prove the following theorem along with corollaries and apply them to solve appropriate problems. 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	7.2 Equation involving	i) Define absolute value.

		Absolute Value	
	13	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.
	14	20.1 Sides and Angles of a Triangle	Prove the following theorem along with corollaries and apply them to solve appropriate problems. iv) From a point, out-side a line, the perpendicular is the shortest distance from the point to the line.
	15	15.2 Collinear Points	i) Define collinear points. Distinguish between collinear and non-collinear points.

Sec-B	i	1.5 Multiplicative Inverse of a Matrix	ii) Evaluate determinant of a matrix. iii) Define singular and non-singular matrices. v) Find multiplicative inverse of a non-singular matrix A.
	ii	2.4 Laws of Exponents/Indices	ii) Apply the laws of exponents to simplify expressions with real exponents.
	iii	2.5 Complex Numbers 2.6 Basic Operations on Complex numbers	ii) Recognize a as real part and b as imaginary part of $z = a + ib$. iii) Define conjugate of a complex number. Carryout basic operations on complex numbers
	iv	4.4 Rationalization	Explain rationalization (with precise meaning) of real numbers of the types $\frac{1}{a+b\sqrt{x}}$, $\frac{1}{\sqrt{x}+\sqrt{y}}$ and their combinations where x and y are natural numbers and a and b are integers
	v	5.1 Factorization	Type IV: $\begin{cases}(ax^2+bx+c)(ax^2+bx+d)+k,\\(x+a)(x+b)(x+c)(x+d)+k,\\(x+a)(x+b)(x+c)(x+d)+kx^2,\end{cases}$
	vi	5.2 Remainder Theorem and Factor Theorem	ii) Find remainder (without dividing) when a polynomial is divided by a linear polynomial. iv) State and prove factor theorem.
	vii	6.1 Highest Common Factor and Least Common Multiple	ii) Use factor or division method to determine highest common factor and least common multiple.
	viii	6.3 Square Root of Algebraic Expression	Find square root of algebraic expression by division.
	ix	19.1 Line Bisectors and Angle Bisectors	Prove the following theorems along with corollaries and apply them to solve appropriate problems. i) Any point on the right bisector of a line segment is equidistant from its end points.
	x	7.2 Equation involving Absolute Value	ii) Solve the equation, involving variable.
	xi	6.2 Basic Operations on Algebraic	Use highest common factor and least common multiple to reduce fractional expressions involving +, −,×, ÷ .

		Fractions	
	xii	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 $a \neq 1$).
	xiii	17.1 Congruent Triangles	Prove the following theorems along with corollaries and apply them to solve appropriate problems. ii) If two angles of a triangle are congruent then the sides opposite to them are also congruent.
	xiv	21.1 Ratio and Proportion	Prove the following theorem along with corollaries and apply to solve the appropriate problems. i) A line parallel to one side of a triangle, intersecting the other two sides, divides them proportionally.
Sec-C	Q 3	1.4 Multiplication of Matrices 1.5 Multiplicative Inverse of a Matrix	vii) Verify the result $(AB)^t = B^t A^t$. v) Find multiplicative inverse of a non- singular matrix A and verify that $AA^{-1} = I = A^{-1}A$ where I is theidentity matrix.
	Q 4	22.1 Pythagoras' Theorem	Prove the following theorems 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. (Pythagoras' theorem).
	Q 5	23.1 Theorems Related with Area	Prove the following theorems along with corollaries and apply them to solve appropriate problems. i) Parallelograms on the same base and lying between the same parallel lines (or of the same altitude) are equal in area.
	Q 6	15.2 Collinear Points	iii) Use distance formula to show that the given three non-collinear points form: • an equilateral triangle, • an isosceles triangle, • a right angled triangle, • a scalene triangle.
	Q 7	29.1 Construction of Triangle	ii) Draw: • perpendicular bisectors of a given triangle and verify their concurrency.

MATHEMATICS SSC-I

Table of Specifications

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	14. Linear Graphs And Their Application	15. Introduction to Co-ordinate Geometry	17. Congruent Triangles	18. Parallelograms & Triangles	19. Line Bisectors & Angle Bisectors	20. Sides & Angles Of Triangle.	21. Ratio & Proportion	22. Pythagoras Theorem.	23. Theorems Related with Area	29. Practical Geometry - Triangles	Total marks for each assessment objective	% age
Knowledge based	**1 (1) (1)**		**1 (3) (1)** **2 *xii* (4)**	**1 (4) (1)**		**2 *xi* (4)**	**1 (7) (1)** **1 (12) (1)**					**2 *ix* (4)**			**4 (8)**	**5 (8)**		**33**	**29.7%**
Understanding based	**2 *i* (4)** **3 (8)**	**1 (2) (1)** **2 *iii* (4)**		**1 (5) (1)** **2 *iv* (4)**	**1 (6) (1)** **2 *v* (4)** **2 *vi* (4)**	**2 *vii* (4)** **2 *viii* (4)**	**2 *x* (4)**	**1 (8) (1)** **1 (10) (1)**	**1 (9) (1)** **1 (15) (1)** **6 (8)**									**55**	**49.5%**
Application based		**2 *ii* (4)**								**2 *xiii* (4)**	**1(11)(1)**		**1 (14)(1)**	**2 *xiv* (4)**	**1 (13) (1)**		**7 (8)**	**23**	**20.7%**
Total marks for each topic	**13**	**09**	**05**	**06**	**09**	**12**	**06**	**02**	**10**	**04**	**01**	**04**	**01**	**04**	**09**	**08**	**08**	**111**	**100%**

KEY:

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