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_____

MATHEMATICS SSC–II

(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 types represents $(x-3)(x+3)=0$?

A. Quadratic equation ◯ B. Linear equation ◯

C. Cubic equation ◯ D. Pure quadratic equation ◯

(2) If b^2-4ac of an equation is the discriminant than the equation would be of the form:

A. $ax^2-bx+c=0$ ◯ B. $ax^2+bx+c=0$ ◯

C. $ax^2+bx+c=0$ ◯ D. $ax^2-bx-c=0$ ◯

(3) Which one of the following cannot be factorized without using synthetic division method?

A. $3x^2+5x+2$ ◯ B. $5x+10$ ◯

C. $3x^4+3x^3-2x+6$ ◯ D. $x^2-\frac{1}{x^2}$ ◯

(4) If α,β are the roots of $2x^2-6x-4=0$, then what is value of $\alpha^2\beta^3+\alpha^3\beta^2$?

A. -12 ◯ B. 12 ◯

C. 6 ◯ D. -6 ◯

(5) Which one of the following are the partial fractions of $\frac{x^3}{x^3+1}$?

A. $\frac{Ax^3}{x+1}+\frac{Bx+C}{x^2-x+1}$ ◯ B. $1+\frac{A}{x-1}+\frac{Bx+C}{x^2+x+1}$ ◯

C. $1+\frac{A}{x+1}+\frac{Bx+C}{x^2-x-1}$ ◯ D. $1+\frac{A}{x+1}+\frac{Bx+C}{x^2-x+1}$ ◯

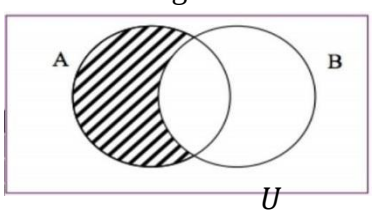
(6) Which one of the following expressions shows the shaded region?

A. $A\cap B'$ ◯

B. $A'\cap B$ ◯

C. $A\cup B'$ ◯

D. $A'\cup B$ ◯



(7) If $\overline{x} = 7$, $\sum f = 30$ and $\sum fx = 120 + 3k$ then value of k is

A. 30 ◯ B. -30 ◯

C. -11 ◯ D. 11 ◯

(8) Which one of the following is **NOT** equal to $\tan\theta$ for a unit circle?

A. $\frac{\cos\theta}{\sin\theta}$ ◯ B. $\frac{1}{\cot\theta}$ ◯

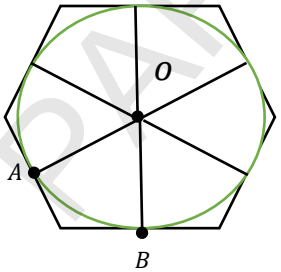
C. $\frac{\sec\theta}{\cos\theta}$ ◯ D. $\frac{\sin\theta}{\cos\theta}$ ◯

(9) Which one of following is the radius of a circle, if an arc of 10cm subtends an angle of 60° ?

A. $\frac{30}{\pi}$cm ◯ B. $\frac{\pi}{30}$cm ◯

C. $\frac{10800}{\pi}$cm ◯ D. $\frac{1}{6}$cm ◯

(10) What is the value of $m\angle AOB$ in the adjoining figure of a hexagon?



A. $360° \div 45°$ ◯

B. $360° \div 60°$ ◯

C. $360° \div 30°$ ◯

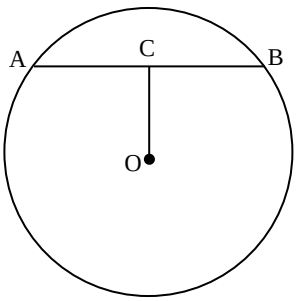
D. $360° \div 120°$ ◯

(11) What is the elevation of Sun if a pole of $6m$ high casts a shadow of $2\sqrt{3}m$?

A. 30° ◯ B. 45° ◯

C. 60° ◯ D. 90° ◯

(12) If $\overline{AB} = 6cm$ is a chord of a circle with centre O and $\overline{OC} \perp \overline{AB}$, then length of $\overline{AC}$ will be:



A. 3 ◯

B. 2 ◯

C. 12 ◯

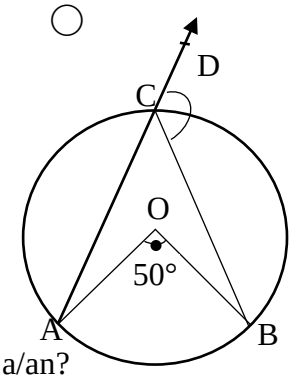
D. 14 ◯

(13) What is the value of x if 64, x and 1 are in continued proportion?

A. 3 ◯ B. $\pm\sqrt{3}$ ◯

C. $\sqrt{3}$ ◯ D. ± 3 ◯

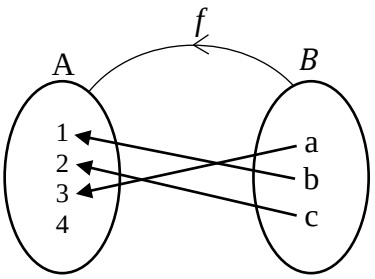
(14) In the drawn figure, what is the value of $m\angle BCD$?



A. 165° ◯ B. 155° ◯

C. 80° ◯ D. 130° ◯

(15) If $f: B \to A$, then which one of the following represents a/an?



A. Onto function ◯

B. Bijective function ◯

C. Injective function ◯

D. Into function ◯

Federal Board SSC-II 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 × 4 = 36)

i. Solve the equation $3x^2 + 4x - 5 = 5x^2 + 2x + 1$.

ii. Product of two consecutive numbers is 132.
   a. If the smaller number is *x* then what is the larger number?
   b. Show that $x^2 + x - 132 = 0$
   c. Solve the equation $x^2 + x - 132 = 0$ and hence find the numbers.

iii. If P is directly proportional to Q and P = 12 when Q = 4.What is:
   a. the equation connecting *P* and *Q*.
   b. the value of *P*, when *Q* = 8
   c. the value of *Q*, when *P* = 21

iv. Solve the system of equations: $4x^2 + 3y^2 = 37$; $3x^2 - y^2 = 5$

v. If U= {1, 2, 3, ... , 10}, A = {2, 4, 6} and B = {1, 3, 5}, then find
   a. A' b. B' c. $(A \cap B)'$
   d. Verify that $(A \cap B)' = A' \cup B'$

vi. Given that set A = {1, 2, 3} and B = {2, 4, 6}, then find:
   (i) A × B (ii) R = {(*x*, *y*) | *y* = 2*x*} (iii) Domain and Range of R

vii. The table given below shows the number of goals scored by a soccer team in 10 matches:

4	1	2	1	0	0	3	2	3	3

Find:
   a. Mean b. Median c. Mode

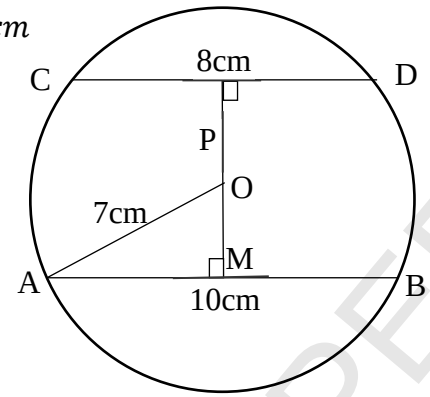
viii. If $\tan\theta = \frac{4}{3}$ and $\sin\theta < 0$
   a. Find the quadrant in which the terminal side of the angle lies?
   b. Find the values of $\sec\theta$ and $\operatorname{cosec}\theta$.
   c. Show that $1 + \cot^2\theta = \operatorname{cosec}^2\theta$.

ix. Prove that $\frac{\sin\theta}{1+\cos\theta} + \cot\theta = \operatorname{cosec}\theta$.

x. In $\Delta PQR, m\overline{QR} = 6cm, m\overline{PR} = 2\sqrt{2}cm$ and $\angle PRQ = 135^\circ$.
   a. Draw perpendicular from *P* to $\overline{QR}$, to meet $\overline{QR}$ produced at *S* and find $\overline{RS}$.
   b. Find $\overline{PQ}$ by using $(m\overline{PQ})^2 = (m\overline{QR})^2 + (m\overline{PR})^2 + 2(m\overline{QR})(m\overline{RS})$.

xi. In the given figure, $m\overline{AB} = 10cm$, $m\overline{CD} = 8cm$ $m\overline{OA} = 7cm$

Find: (i) $m\overline{AM}$ (ii) $\overline{OP}$ (iii) $m\overline{OM}$



xii. Prove that if a line is drawn perpendicular to a radial segment of a circle at its outer end point, it is tangent to the circle at that point.

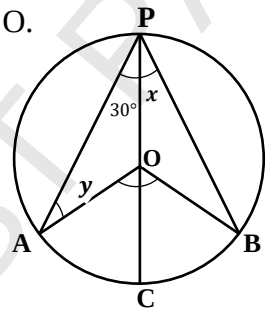
xiii. A, B, C and P are four points on a circle with centre O.

Given that POC is a diameter of the circle.

Find:

a. x b.y c.$\angle AOB$

Also write the reasons to justify your steps.



xiv. Circumscribe a circle about a triangle ABC with sides $\overline{AB} = 6cm$, $\overline{BC} = 4cm$, $\overline{AC} = 4cm$ and measure its radius.

SECTION – C (Marks 24)

Note: Attempt any **THREE** questions. Each question carries equal marks. (3 × 8 = 24)

Q.3 The area of a rectangle is 48cm^2. If length and width of each is increased by 4cm. The area of larger rectangle is increased by 12cm^2. Find the length and width of the original rectangle.

Q.4 Prove that if two arcs of a circle (or of congruent circles) are congruent then the corresponding chords are equal.

Q.5 Using theorem of componendo-dividendo, find the value of $\frac{x-6a}{x+6a} - \frac{x+6b}{x-6b}$, if $x = \frac{12ab}{a-b}$

Q.6 Resolve $\frac{x^2}{(1-x)(1+x^2)^2}$ into partial fractions.

Q.7 Find the range, variance and standard deviation for the following data set:
1245, 1255, 1654, 1547, 1245, 1255, 1547, 1737, 1989, 2011.

MATHEMATICS SSC-II

Student Learning Outcomes Alignment Chart

(Curriculum 2006)

Sec-A	Q 1	Contents and Scope	Student Learning Outcomes
	1	8.1 Quadratic Equation	Define quadratic equation.
	2	9.1 Nature of the Roots of a Quadratic Equation	i) Define discriminant $(b2 - 4ac)$ of thequadratic expression ax^2+bx+c.
	3	9.6 Synthetic Division	i) Describe the method of synthetic division.
	4	9.4Symmetric Functions of Roots of a Quadratic Equation.	ii) Evaluate a symmetric Function of the roots of a quadratic equation in terms of its coefficients.
	5	11.2 Resolution of Fraction into Partial Fractions.	Resolve an algebraic fraction into partial fractions when its denominator consists of non-repeated linear factors.
	6	12.1.3 Venn Diagram	i)Use Venn diagram to represent • union and intersection of sets, • complement of a set.
	7	13.3 Measures of Central Tendency	i) Calculate the arithmetic mean by definition (for ungrouped data)
	8	16.3 Trigonometric Ratios	iii) Define trigonometric ratios and their reciprocals with the help of a unit circle.
	9	16.2 Sector of a circle	i) Establish the rule $l = r\theta$, where r is the radius of the circle, l the length of circular arc and θ the central angle measured in radians.
	10	30.2 Circles attached to polygons	viii) Circumscribe a regular hexagon about a given circle.
	11	16.5Angle of elevation and Depression.	ii) Solve real life problems involving angle of elevation and depression
	12	25.1 Chords of a Circle	Prove the following theorem along with corollaries and apply them to solve appropriate problems. iii) Perpendicular from the centre of a circle on a chord bisects it.
	13	10.1 Ratio, Proportions and Variations	ii) Find 3rd, 4th mean and continued proportion.
	14	28.1 Angle in a Segment of a Circle	Prove the following theorem along with corollaries and apply them to solve appropriate problems. i) The measure of a central angle of a minor arc of a circle, is double that of the angle subtended by the corresponding major arc.
	15	12.3 Function	ii) To demonstrate the following: • Into function • One-one function • Injective function • Surjective function

			• Bijective function
Sec B	Q2		
	i	8.2Solution of Quadratic Equations	i) Solve a quadratic equation in one variable by • Factorization, • Completing square
	ii	9.7 Simultaneous Equations	Solve a system of two equations in two variables when • one equation is linear and the other is quadratic, • both the equations are quadratic.
	iii	10.1 Ratio, Proportion and Variation.	i) Define ratio, proportions and variations (direct and inverse)
	iv	9.7 Simultaneous Equations	Solve a system of two equations in two variables when • one equation is linear and the other is quadratic, • both the equations are quadratic.
	v	12.1.2 Properties of Union and Intersection	iv) Give formal proofs of the following fundamental properties of union and intersection of two or three sets. • Commutative property of union, • Commutative property of intersection, • Associative property of union, • Associative property of intersection, • Distributive property of union over intersection, • Distributive property of intersection over union, • De Morgan's laws.
	vi	12.1.4 Ordered Pairs and Cartesian Product 12.2 Binary relation	viii) Recognize ordered pairs and Cartesian product. Define binary relation and identify its domain and range.
	vii	13.3 Measures of Central Tendency	i) Calculate (for ungrouped and grouped data) • Arithmetic mean by definition and using deviations from assumed mean, • Median, mode geometric mean and harmonic mean
	viii	16.3 Trigonometric Ratios	v) Recognize the signs of trigonometric ratios in different quadrants vi) Find the values of remaining trigonometric ratios if one trigonometric ratio is given.
	ix	16.4 Trigonometric Identities	Prove the trigonometric identities and apply them to show different trigonometric relations.
	x	24.1 Projection of a side of a triangle	Prove the following theorem along with corollaries and apply them to solve appropriate problems.

			i) In an obtuse-angled triangle, the square on the side opposite to the obtuse angle is equal to the sum of the squares on the sides containing the obtuse angle together with twice the rectangle contained by one of the sides, and the projection on it of the other.
	xi	25.1 Chords of a Circle	Prove the following theorem along with corollaries and apply them to solve appropriate problems. iii) Perpendicular from the centre of a circle on a chord bisects it.
	xii	26.1 Tangent to a Circle	Prove the following theorems along with corollaries and apply them to solve appropriate problems. i) If a line is drawn perpendicular to a radial segment of a circle at its outer end point, it is tangent to the circle at that point.
	xiii	28.1 Angle in a Segment of a Circle	Prove the following theorem along with corollaries and apply them to solve appropriate problems. i) The measure of a central angle of a minor arc of a circle, is double that of the angle subtended by the corresponding major arc.
	xiv	30.2 Circles attached to Polygons	i) Circumscribe a circle about a given triangle.
Sec C			
	Q 3	9.7 Simultaneous Equations	Solve the real life problems leading to quadratic equations.
	Q 4	27.1 Chords and Arcs	Prove the following theorems along with corollaries and apply them to solve appropriate problems. i) If two arcs of a circle (or of congruent circles) are congruent then the corresponding chords are equal.
	Q 5	10.2 Theorems on Proportion	Apply theorem of componendo-dividendo to find proportions.
	Q 6	11.2 Resolution of Fraction into Partial Fractions	Resolve an algebraic fraction into partial fractions when its denominator consists of • repeated quadratic factors.
	Q 7	13.4 Measures of Dispersion	Measure range, variance and standard deviation.

MATHEMATICS SSC-II

Table of Specifications

Topics	8. Quadratic Equations	9. Theory of Quadratic Equations	10. Variations	11. Partial Fractions	12. Sets and Functions	13. Basic Statistics	16. Introduction to Trigonometry	24. Projection of a Side of a Triangle	25. Chords of a Circle	26. Tangent to a Circle	27. Chords and Arcs	28. Angle in a Segment of a Circle	30. Practical Geometry Circles	Total marks for each assessment objective	% age
Knowledge based	1 (1) (1)	1 (2) (1)	2 iii (4)		1 (15) (1) 2 vi (4) 2 v (2)	7 (4)	1 (8) (1) 2 viii (2)			2 xii (4)	4 (8)		1 (10) (1)	33	29.7%
Understanding based	2 i (4)	1 (3) (1) 1 (4) (1) 2 ii (4) 2 iv (4) 3 (8)	1(13) (1)	1 (5) (1) 6 (8)	1 (6) (1) 2 v (2)	1 (7) (1) 2 vii (4) 7 (4)	2 viii (2) 2 ix (2)	2 x(a) (2)				1 (14) (1)	2 xiv (4)	55	49.5%
Application based			5 (8)				1 (9) (1) 1 (11) (1) 2 ix (2)	2 x (b)(2)	1 (12) (1) 2 xi (4)			2 xiii (4)		23	20.7%
Total marks for each topic	05	19	13	09	10	13	11	04	05	04	08	05	05	111	100%

KEY:

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