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Answer Sheet No. _____

Sign. of Candidate _____

Sign. of Invigilator _____

MATHEMATICS SSC–II (3rd 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) Cancellation of x on both sides of $6x^2 = 21x$ means:
 A. The loss of one root ○ B. No loss of any root ○
 C. The gain of one root ○ D. Undefined solution ○
- (2) If $b^2 - 4ac > 0$ is a perfect square then roots of $ax^2 + bx + c = 0$ are?
 A. Irrational, Equal ○ B. Rational, Equal ○
 C. Rational, Unequal ○ D. Irrational, Unequal ○
- (3) On simplifying $(7 + 5\omega + 5\omega^2)^2$ we get:
 A. 4 ○ B. 12 ○
 C. 17 ○ D. 144 ○
- (4) If y^2 varies inversely as x^3 then:
 A. $y^2 = kx^3$ ○ B. $y^2 = \frac{k}{x^3}$ ○
 C. $\frac{y^2}{x^3} = 1$ ○ D. $y^2x^3 = 1$ ○
- (5) Partial fractions of $\frac{x^2+1}{(x+1)(x-1)}$ are of the form:
 A. $1 - \frac{A}{(x+1)} + \frac{B}{(x-1)}$ ○ B. $1 + \frac{A}{(x+1)} + \frac{B}{(x-1)}$ ○
 C. $1 + \frac{A}{(x+1)} + \frac{Bx}{(x-1)}$ ○ D. $\frac{A}{(x+1)} + \frac{B}{(x-1)}$ ○
- (6) If $A \cap B = \emptyset$, then set A and B are:
 A. Subsets of each other ○ B. Overlapping sets ○
 C. Disjoint sets ○ D. Equal sets ○

- (7) If $f : A \rightarrow B$ and range of $f \neq B$ then f is a/an:
- A. Into function B. Onto function
 C. Bijective function D. Injective function

- (8) If $Y = X + 5$ then $\bar{Y} = ?$
- A. \bar{X} B. 5
 C. $\bar{X} + 5$ D. $5\bar{X}$

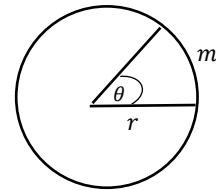
- (9) $\sum(X - \bar{X}) = ?$
- A. 2 B. 1
 C. -1 D. 0

- (10) In which of the following quadrants θ lies when $\sin \theta < 0, \sec \theta < 0$?
- A. I B. II
 C. III D. IV

- (11) $\sec \theta \cot \theta = ?$
- A. cosec θ B. $\tan \theta$
 C. $\sin \theta$ D. $\cos \theta$

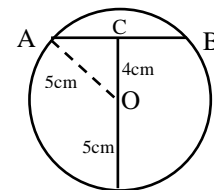
- (12) What is the value of m , if $r = 15$ and $\theta = \frac{\pi}{3}$?

- A. 5π B. $\frac{\pi}{5}$
 C. 45π D. $\frac{45}{\pi}$



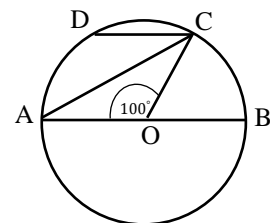
- (13) What is the length of chord intercepted at 4cm away from the centre of the circle?

- A. 4cm B. 6cm
 C. 7cm D. 9cm



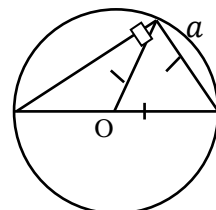
- (14) If $\overline{DC} \parallel \overline{AB}$ and $\angle AOC = 100^\circ$ (in the figure), then $\angle ACD = ?$

- A. 30° B. 40°
 C. 50° D. 60°



- (15) In the adjoining figure, length of the escribed radii a is:

- A. a B. $2a$
 C. $3a$ D. $\frac{1}{2}a$



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. ($9 \times 4 = 36$)

- i. Apply quadratic formula to solve the equation $\frac{2x+1}{x+2} - \frac{2x+4}{2x+8} = 0$
- ii. Find the value of x : $3 \cdot 3^{2x+1} - 10 \cdot 3^x + 1 = 0$
- iii. If θ and ϕ are the roots of $y^2 - 7y + 9 = 0$. Form an equation whose roots are 2θ and 2ϕ .
- iv. The length of a rectangle is 5cm more than its breadth. If the area of the rectangle is 50cm^2 , find its length and breadth.
- v. Find the fourth proportional to: $(x^3 - y^3)$, $(x^2 - y^2)$, $(y^2 + 2xy + y^2)$
- vi. The current I in a wire varies directly as electromotive force E , and inversely as resistance R . If $I = 32$ amperes, when $E = 1280$ volts and $R = 80$ ohms, what will be the value of I when $E = 1500$ volts and $R = 180$ ohms?
- vii. Resolve $\frac{4x+2}{2(x-1)(x^2+1)}$ into partial fractions.
- viii. If $U = \{1, 2, 3, \dots, 20\}$, $A = \{1, 2, 3, \dots, 10\}$ and $B = \{2, 4, 6, 8, 10, 12, 14, 16\}$, then find $(A \cup B) - (A \cap B)^c$
- ix. The marks of four students in Mathematics are as follows. Determine Variance and Standard Deviation.

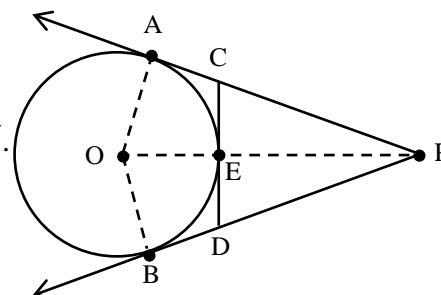
Students	1	2	3	4
Marks	90	80	70	90

- x. If $\tan \theta = \frac{\sqrt{7}}{2}$, then find the values of other trigonometric ratios.
- xi. Prove that, the perpendicular from the center of a circle on a chord bisects it.
- xii. \overrightarrow{PA} and \overrightarrow{PB} are tangents to the circle from an external point P .

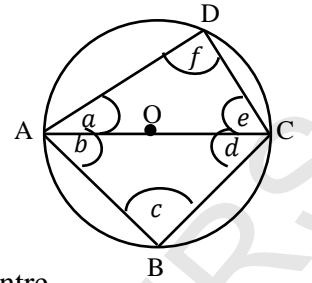
\overrightarrow{CD} is another tangent touching the circle at E such that

$$m\overrightarrow{CE} = m\overrightarrow{DE} = 2\text{cm}.$$

If $m\overrightarrow{PA} = 8\text{cm}$, $m\overrightarrow{OA} = 3\text{cm}$ then, find $m\overrightarrow{PC} + m\overrightarrow{PD}$.



- xiii. In the adjoining figure, ABCD is a cyclic quadrilateral inscribed in a circle having centre at O.
If $a = 30^\circ$, $d = 45^\circ$, then find the values of b, c, e and f .



- xiv. Prove that, equal chords of a circle subtend equal angles at the centre.

SECTION-C (Marks-24)

NOTE: Attempt any three questions. All questions carry equal marks. **(3 × 8 = 24)**

Q.3 Solve the equation: $x^4 - 4x^3 - 3x^2 + 4x + 1 = 0$

Q.4 Verify De-Morgan's Laws for the following sets:

$$U = \{x|x \in N \wedge 5 \leq x \leq 20\}, A = \{x|x \in E \wedge 5 \leq x \leq 20\}, B = \{x|x \in P \wedge 5 \leq x \leq 20\}$$

Q.5 For the following frequency distribution

Classes	0 – 10	10 – 20	20 – 30	30 – 40	40 – 50
f	3	4	5	6	7

- Calculate Geometric Mean of the data.
 - Calculate Harmonic Mean of the data.
- Q.6** Circumscribe a regular hexagon about a circle of radius 5cm.
- Q.7** In any triangle, the sum of the squares on any two sides is equal to twice the square on half the third side together with twice the square on the median which bisects the third side (Apollonius' Theorem).

MATHEMATICS SSC-II (3rd Set)
Student Learning Outcomes Alignment Chart
 Science Group (Curriculum 2006)

Sec-A	Q 1	Contents and Scope	Student Learning Outcomes
	i	8.2 Solution of Quadratic Equations	Solve a quadratic equation in one variable by factorization
	ii	9.1 Nature of the Roots of a Quadratic Equation	iii) Discuss the nature of roots of a quadratic equation through discriminant
	iii	9.2 Cube Roots of Unity and their Properties	iv) Use properties of cube roots of unity to solve appropriate problems.
	iv	10.1 Ratio, Proportions and Variations	i) Define ratio, proportions and variations (direct and inverse).
	v	11.2 Resolution of Fraction into Partial Fractions.	Resolve an algebraic fraction into partial fractions when its denominator consists of non-repeated linear factors.
	vi	12.1.3 Venn Diagram	i) Use Venn diagram to represent <ul style="list-style-type: none"> • union and intersection of sets, • complement of a set.
	vii	12.3 Function	i) Demonstrate the following: <ul style="list-style-type: none"> • into function, • one-one function, • into and one-one function (injective function), • onto function (surjective function), • one-one and onto function (bijective function).
	viii	13.3 Measures of Central Tendency	ii) Recognize properties of arithmetic mean.
	ix	13.3 Measures of Central Tendency	i) Calculate (for ungrouped and grouped data): <ul style="list-style-type: none"> • Arithmetic mean by definition and using deviations from assumed mean.
	x	16.3 Trigonometric Ratios	v) Recognize signs of trigonometric ratios in different quadrants.
	xi	16.4 Trigonometric Identities	Prove the trigonometric identities and apply them to show different trigonometric relations.
	xii	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.
	xiii	25.1 Chords of a Circle	ii) A straight line, drawn from the centre of a circle to bisect a chord (which is not a diameter) is perpendicular to the chord.
	xiv	28.1 Angle in a Segment of a Circle	i) The angle <ul style="list-style-type: none"> • in a semi-circle is a right angle, • in a segment greater than a semi-circle is less than a right angle,

			<ul style="list-style-type: none"> in a segment less than a semi-circle is greater than a right angle.
	xv	30.2 Circles attached to Polygons	iii) Escribe a circle to a given triangle.
Sec B	Q2		
	i	8.3 Quadratic Formula	ii) Use quadratic formula to solve quadratic equations.
	ii	8.4 Equations Reducible to Quadratic Form	iv) Solve exponential equations in which the variables occur in exponents
	iii	9.5 Formation of Quadratic Equation	ii) Form the quadratic equation whose roots, for example, are of the type: <ul style="list-style-type: none"> $2\alpha + 1, 2\beta + 1,$ $\alpha^2, \beta^2,$ $1/\alpha, 1/\beta$ $\alpha/\beta, \beta/\alpha$ $\alpha + \beta, 1/\alpha + 1/\beta$ Where α and β are the roots of a given quadratic equation
	iv	9.7 Simultaneous Equations	Solve the real life problems leading to quadratic equations.
	v	10.1 Ratio, Proportions and Variations	ii) Find 3 rd , 4 th mean and continued proportion.
	vi	10.3 Joint Variation	ii) Solve real life problems based on variations.
	vii	11.2 Resolution of Fraction into Partial Fractions	Resolve an algebraic fraction into partial fractions when its denominator consists of: <ol style="list-style-type: none"> non-repeated linear factors. non-repeated quadratic factors.
	viii	12.1.1 Operations on Sets	iii) Perform operation on sets <ul style="list-style-type: none"> union intersection difference complement.
	ix	13.4 Measures of Dispersion	Measure range, variance and standard deviation.
	x	16.3 Trigonometric Ratios	vi) Find the values of remaining trigonometric ratios if one trigonometric ratio is given.
	xi	25.1 Chords of a Circle	iii) Perpendicular from the centre of a circle on a chord bisects it.
	xii	26.1 Tangent to a Circle	iii) The two tangents drawn to a circle from a point outside it, are equal in length.
	xiii	28.1 Angle in a Segment of a Circle	ii) The angle in a semi-circle is a right angle. iv) The opposite angles of any quadrilateral inscribed in a circle are supplementary.
	xiv	27.1 Chords and Arcs	iii) Equal chords of a circle (or of congruent circles) subtend equal angles at the centre (at the corresponding centres).

Sec C			
	Q 3	8.4 Equations Reducible to Quadratic Form	iii) Solve reciprocal equations of the type. $a(x^2 + \frac{1}{x^2}) + b(x + \frac{1}{x}) + c = 0$
	Q 4	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. <ul style="list-style-type: none"> • De Morgan's laws.
	Q 5	13.3 Measures of Central Tendency	i) Calculate (for ungrouped and grouped data) <ul style="list-style-type: none"> • Median, Mode, Geometric Mean, Harmonic Mean.
	Q6	30.2 Circles attached to polygons	viii) Circumscribe a regular hexagon about a given circle.
	Q 6	11.2 Resolution of Fraction into Partial Fractions	Resolve an algebraic fraction into partial fractions when its denominator consists of <ul style="list-style-type: none"> • Repeated quadratic factors.
	Q 7	24.1 Projection of a Side of a Triangle	iii) In any triangle, the sum of the squares on any two sides is equal to twice the square on half the third side together with twice the square on the median which bisects the third side (Apollonius' Theorem).

MATHEMATICS SSC-II (3rd Set)

Table of Specification

Units	8. Quadratic Equations	9. Theory of Quadratic Equations	10. Variations	11. Partial Fractions	12. Sets and Functions	13. Basic Statistics	14. 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	% age
Knowledge based		1(2)(1)	1(4)(1)		1(6)(1) 1(7)(1) 4(8)	1(9)(1)		7(8)	2 xi (4)		2 xiv (4)	2 xiii (4)		33	29.7%
Comprehension based	1(1)(1) 2 ii (4) 3(8)	1(3)(1) 2 iii (4)	2 v (4)	2 vii (4) 1(5)(1)	2 viii (4)	1(8)(1) 5(8)	1(10)(1) 1(11)(1) 1(12)(1) 2 x (4)						6(8)	55	46.5%
Application based	2 i (4)	2 iv (4)	2 vi (4)			2 ix (4)			1(13)(1)	2 xii (4)		1(14)(1)	1(15)(1)	23	20.7%
Total marks for each unit	17	10	09	05	14	14	07	08	05	04	04	05	09	111	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