S.S.C. MATHEMATICS MODEL PAPER, MARCH

PAPER – II

TIME: 2 ½ HRS.	PARTS A&B	MAX. MARKS: 50
TIME: 2 HRS.	**PART – A**	**MARKS: 35**

SECTION – I

$5 \times 2 = 10$

Note: 1. Answer any **FIVE** questions, choosing atleast **TWO** from each of the following groups A & B.

2. Each question carries **2 Marks.**

GROUP – A

(Statements and Sets, Functions, Polynomials)

1. Show that the statement $P \wedge (\sim q) \Rightarrow p$ is a tautology.
2. Show that $A \cap B' = A - B$.
3. If $f(x) = \frac{1+x}{x-1}$ $(x \neq 1)$ then find the value of $f(x) + f\left(\frac{1}{x}\right)$.
4. Find the value of k, of the polynomial $x^3 - 3x^2 + 4x + k$ is exactly divisible by $x - 2$.

GROUP – B

(Linear Programming, Real Numbers, Progressions)

5. The Vertices of convex polygon OABC are O (0, 0), A (5, 0), B (2, 3), C (0, 5). Find the maximum value of the objective function $f = 2x + 3y$
6. If $a^x = b$, $b^y = c$, $c^z = a$. Show that $xyz = 1$
7. Evaluate: $\lim_{x \to a} \frac{x^{n/2} - a^{n/2}}{x^{1/2} - a^{1/2}}$
8. Determine the 25th term of an A.P. whose 9th term is -6 and the common difference is $\frac{5}{4}$

SECTION – II

$4 \times 1 = 4$

Note: 1. Answer any **FOUR** of the following SIX questions.

2. Each question carries **1 Mark.**

9. Write the implication of the statements
   i) 2 is a prime number, ii) 2 is an even number.
10. If $f = \{(1, 3), (2, 5), (3, 7)\}$
    $g = \{(3, 7), (5, 9), (7, 10)\}$ Find gof.
11. Write the nature of the roots of the quadratic equation $x^2 - 4x + 5 = 0$
12. Define "iso-Profit line".
13. Simplify $(x^{a-b})^a$, $(x^{a-b})^b$, $(x^{a-b})^0$
14. Find the middle term in the expansion of $\left(3x - \frac{1}{2x}\right)^6$

SECTION – III

$4 \times 4 = 16$

Note: 1. Answer any **FOUR** questions, choosing atleast **TWO** from each of the following groups i.e., Group A & B.

2. Each question carries **4 Marks.**

GROUP – A

(Statements and Sets, Functions, Polynomials)

15. Prove that $A - (B \cup C) = (A - B) \cap (A - C)$ for any three sets A, B and C
16. If $f(x) = x+2$, $g(x) = 2x+3$, $h(x) = 3x+4$ $\forall x \in R$
    Find i) $(f \circ g)(x)$ ii) $(g \circ g)(x)$
17. Let the function $f: R \to R$ be defined by $f(x) = 3x - 5$ find a formula that defines the inverse function f^{-1}.
18. The expression $ax^2 + bx + c$ equals -2 when $x = 0$, leaves a remainder 3 when divided by $(x-1)$ and the remainder -3 when divided by $(x+1)$ then find the value of a, b and c.

GROUP – B

(Linear programming, Real number, Progressions)

19. A sweet shop makes gift packets of sweets combining two special types of sweets A and B which weigh 2 Kg. Atleast 3Kg of A and no more than 5 Kg of B should be used. The shop makes a profit of Rs.15 on A and Rs.20 on B per Kg. Determine the product mix so as to obtain maximum profit. (Write only objective function and the system of inequation without graph).
20. If $a^x = b^y = c^z$ and $\frac{y}{x} = \frac{c}{b}$ then show that $\frac{y}{x} = 2\frac{z}{x} - z$
21. Find the sum to n terms of the series $7 + 77 + 777 + \ldots$
22. If $(b-c)$, $(c-a)$, $(a-b)$ are in H.P. then show that $\frac{1}{a^2}, \frac{1}{b^2}, \frac{1}{c^2}$ are also in H.P.

SECTION – IV

(Linear programming, Quadratic equations and inequations)

Note: 1. Answer any **ONE** question from the following

2. The question carries 5 Marks. $1 \times 5 = 5$

23. Maximise $f = 3x + y$ subject to the constraints
    $8x + 5y \leq 40$ $\quad -4x + 3y \geq 12$ $\quad x \geq 0, y \geq 0$
24. Draw the graph of $y = x^2 - 5x + 6$ to find the roots of $x^2 - 5x + 6 = 0$.

TIME: 30 MINUTES.	PART – B	MARKS: 15

Note: 1. Each question carries ½ Mark.

2. Answers are to be written in the question paper only.

3. All questions are to be answered.

4. Marks will not be given for over-written, no-written or erased answers.

I. MULTIPLE CHOICE QUESTIONS.

$10 \times \frac{1}{2} = 5$

1. The existential quantifier is denoted by the symbol
   (A) $\in$ (B) $\subset$ (C) $\exists$ (D) $\forall$ [ ]
2. If $n(A \cup B) = n(A) + n(B)$ then A and B are _____ sets.
   (A) Equal (B) Equivalent (C) Finite (D) Disjoint [ ]
3. If $f = \{(x, 3) / x \in R\}$ then 'f' is a
   (A) One-one function (B) Constant function
   (C) Onto function (D) Identity function [ ]
4. If $f(x) = a_0 x^n + a_1 x^{n-1} + a_2 x^{n-2} + \ldots + a_n$ and $a_0 + a_1 + a_2 + \ldots + a_n = 0$ then the factor of $f(x)$ is
   (A) $(x+1)$ (B) $(x-1)$
   (C) $(x+1)$ and $(x-1)$ (D) None [ ]
5. If $x^2 - 4x + 3 < 0$ then the value of x lies in between.
   (A) 1 and 2 (B) 1 and 3
   (C) 1 and 4 (D) 4 and 3 [ ]
6. The solution set of a linear programming problem is
   (A) Possible solution (B) Possible region
   (C) Iso-profit line (D) Objective function [ ]
7. $\sqrt[3]{\frac{125}{1000}} =$
   (A) 0.2 (B) 0.02 (C) 0.002 (D) 2 [ ]
8. $\lim_{x \to \infty} \frac{3}{\frac{2x+3}{3x+5}} =$
   (A) $\frac{2}{3}$ (B) $\frac{2}{5}$ (C) $\frac{3}{5}$ (D) $\frac{3}{2}$ [ ]
9. The n^{th} term of the progression 8, 16, 32, 64,...is
   (A) 2^{n-1} (B) 2^n (C) 2^{n+2} (D) 2^{n+1} [ ]
10. If a, b, c are in G.P. then
    (A) $a^2 = bc$ (B) $b^2 = ac$ (C) $c^2 = ab$ (D) $abc = 1$ [ ]

II. FILL IN THE BLANKS WITH SUITABLE ANSWERS.

$10 \times \frac{1}{2} = 5$

11. The counter example for "All prime numbers are odd" is ____.
12. If $n(A \cap B) = 2$, $n(A) = 4$ and $n(B) = 3$ then $n(A \cup B) =$ _____.
13. If the range of a function is equal to its co-domain then it is a _____.
14. The zero of the function $f(x) = 2x - 3$ is _____.
15. The quadratic equation whose roots are $(2+\sqrt{3})$ and $(2-\sqrt{3})$ is _____.
16. The solution set of $x \geq y$, $x \leq y$ is _____.
17. $\frac{a+b+2\sqrt{ab}}{\sqrt{a}+\sqrt{b}} =$ _____.
18. $2^{2x} = 4^{x+1}$ then the value of x is _____.
19. If a, b, c are in A.P. then $\frac{1}{a}, \frac{1}{b}, \frac{1}{c}$ are in _____.
20. In an A.P. if 5 times the 9th term is equal to 7 times the 7th term then _____ term is zero.

III. For the following questions under GROUP – A, Choose the correct answer from GROUP – B and write the letter of the correct answer in the brackets provided against each question

$10 \times \frac{1}{2} = 5$

	GROUP – A	GROUP – B
(i)	21. $A \cup A =$	(A) $\sim p \Leftrightarrow q$
	22. $\sim (p \Leftrightarrow q)$	(B) Demorgan's Law
	23. If $A \to B$	(C) $p \wedge \sim q$
	$f(x_1) = f(x_2) \Rightarrow x_1 = x_2$	(D) Idempotent Law.
	24. $n(A) = 3$, $n(B) = 5$ $n(A \times B) =$	(E) 15
	25. Number of terms in the expansion of $\left(2a^2 - \frac{4}{a^2}\right)^{15}$	(F) Constant function (G) 16 (H) One-one function

	GROUP – A	GROUP – B
(ii)	26) $x > 0$, $y < 0$ then (x, y) lies in the quadrant	(I) -9 (J) 4
	27) $x = -8$ then $\lvert x-1 \rvert =$	(K) $\frac{n(n+1)}{2}$
	28) $x^{2/3}, x^{-4/3}, x^{-2/3}$	(L) Q_4
	29) Σn^2	(M) $\frac{n^2(n+1)^2}{4}$
	30) The 9th term of the progression $-1, -2, -3, \ldots$ is	(N) Q_1 (O) 9 (P) 0 (Zero).

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Rachel Sandford

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