

MAR THOMA RESIDENTIAL SCHOOL, TIRUALLA

FIRST TERMINAL EXAMINATION 2019'20

CLASS: XI

MATHEMATICS

TIME: 3H

MAX MARK: 80

ATTEMPT ALL THE QUESTIONS

SECTION-A

I

1. Find the greatest value of the quadratic function $3 + 5x - 2x^2$ for all real values of x .
2. Find the modulus and argument of $\frac{5-i}{2-3i}$.
3. Using mathematical induction prove that $n(n+1)(n+5)$ is a multiple of 3.
4. Find the range of x for the inequality $x^2 - 2x + 1 \geq 0$.
5. Solve the equation $(x^2 + 3x + 2)^2 - 8(x^2 + 3x) - 4 = 0$. (5 × 2)

II

1. Using mathematical induction prove that $1 + 4 + 7 + \dots + (3n - 2) = \frac{n(3n - 1)}{2}$. (4)
2. (i) Find the square root of $6 + 8i$.
(ii) Find x and y : $(1+i)y^2 + (6+i) = (2+i)x$. (4)
3. a) Find k , so that one root of the equation $2kx^2 - 20x + 21 = 0$ exceeds the other by 2. (3)
b) Find the range of values of x , for which $\frac{x^2 - 2x + 5}{3x^2 - 2x - 5} > \frac{1}{2}$. (4)
4. (a) Using mathematical induction prove that $7^n - 3^n$ is divisible by 4. (3)
(b) The roots of the equation $px^2 - 2(p+2)x + 3p = 0$ differ by 2. Find p , and also the other root? (4)
5. (a) If α and β are the roots of the equation $2x^2 - 3x + 1 = 0$, form an equation whose roots are $\frac{\alpha}{2\beta + 3}$ and $\frac{\beta}{2\alpha + 3}$. (4)
(b) Solve the equation graphically $3x + 2y \leq 18$, $x + 2y \leq 10$, $x \geq 0$, $y \geq 0$ (4)

SECTION-B

I

1. Find the radius of a circle in which a central angle of 72° intercepts an arc of length 22cm.
2. Find the value of $\sin 405 \times \cot 585$.
3. If $\sec \theta = -\frac{13}{12}$ and θ lies in the second quadrant, find the value of $\operatorname{cosec} \theta + \cot \theta$.
4. Prove that $\sin(40 + \theta) \cos(10 + \theta) - \cos(40 + \theta) \sin(10 + \theta) = \frac{1}{2}$.

II

1. Prove that $\frac{\sin(180+\theta) \cos(90+\theta) \tan(270-\theta) \cot(360-\theta)}{\sin(360-\theta) \cos(360+\theta) \operatorname{cosec}(-\theta) \sin(270+\theta)} = 1$

OR

Prove that $\frac{\cos 8 - \sin 8}{\cos 8 + \sin 8} = \tan 37$.

2. Prove that $\frac{\sin 5x - 2 \sin 3x + \sin x}{\cos 5x - \cos x} = \tan x$.
3. Solve the equation $\sin x - 3 \sin 2x + \sin 3x = \cos x - 3 \cos 2x + \cos 3x$
4. If $\cos A = \frac{\sin B}{2 \sin C}$ then show that the triangle is isosceles using sine law and cosine law.
5. If $\cos \theta = \frac{4}{5}$ and $\cos \phi = \frac{12}{13}$ where θ and ϕ both lie in the fourth quadrant, find the values of (i) $\sin(\theta - \phi)$ (ii) $\tan(\phi + \theta)$

OR

Solve $\sin 2x + \sin 4x + \sin 6x = 0$.

III

1. Prove that $\cos 20 \cdot \cos 40 \cdot \cos 60 \cdot \cos 80 = \frac{1}{16}$

2. In any ΔABC prove that $\frac{a^2 - b^2}{c^2} = \frac{\sin(A-B)}{\sin(A+B)}$.

And

Prove that $\frac{\sec 8\theta - 1}{\sec 4\theta - 1}$

(5x4)

(2x6)