

**BOARD OF INTERMEDIATE EDUCATION (AP)**  
**HALF YEARLY EXAMINATIONS - 2021**

**SENIOR INTER MATHEMATICS - IIA**

**MODEL PAPER - 2 (English Version)**

**Time: 3 Hours**

**Max.Marks: 75**

**SECTION – A**

**Note: i) Very short answer type questions.**

**10 × 2 = 20**

**ii) Answer All questions.**

**iii) Each question carries 2 marks.**

1. If  $(\sqrt{3} + i)^{100} = 2^{99} (a + ib)$  then show that  $a^2 + b^2 = 4$ .
2. Express  $1 + i\sqrt{3}$  in the modulus amplitude form.
3. Find the multiplicative inverse of  $7 + 24i$ .
4. If  $x = \text{cis}\theta$ , then find the value of  $\left(x^6 + \frac{1}{x^6}\right)$ .
5. Prove that  $(2 - \omega)(2 - \omega^2)(2 - \omega^{10})(2 - \omega^{11}) = 49$ .
6. For what values of  $x$ , the expression  $x^2 - 5x + 6$  is positive?
7. If the product of the roots of  $4x^3 + 16x^2 - 9x - a = 0$  is 9 then find  $a$ .
8. Find the number of ways of arranging the letters of the word MATHEMATICS.
9. Find the number of diagonals of a polygon with 12 sides.
10. If  ${}^{22}C_r$  is the largest binomial coefficient in the expansion of  $(1 + x)^{22}$ , then find the value of  ${}^{13}C_r$ .

**SECTION – B**

**Note: i) Short answer type questions.**

**5 × 4 = 20**

**ii) Answer any Five questions.**

**iii) Each question carries 4 marks.**

11. If  $(x - iy)^{1/3} = a - ib$  then show that  $\frac{x}{a} + \frac{y}{b} = 4(a^2 - b^2)$ .
12. If the real part of  $\frac{z+1}{z+i}$  is 1, then find the locus of  $z$  where  $z = x + iy$ .
13. Find the maximum value of the function  $\frac{x^2 + 14x + 9}{x^2 + 2x + 3}$  over  $\mathbb{R}$ .
14. Prove that  $\frac{1}{3x+1} + \frac{1}{x+1} - \frac{1}{(3x+1)(x+1)}$  does not lie between 1 and 4 if  $x$  is real.
15. Find the sum of all 4 digit numbers that can be formed using the digits 1, 3, 5, 7, 9.

16. If the letters of the word EAMCET are permuted in all possible ways and if the words thus formed are arranged in the dictionary order, find the rank of the word EAMCET.
17. Simplify  ${}^{34}C_5 + \sum_{r=0}^4 (38-r)C_4$ .

SECTION – C

Note: i) Long answer type questions.

5 × 7 = 35

ii) Answer any Five questions.

iii) Each question carries 7 marks.

18. If 'n' is an integer, then show that  $(1+i)^{2n} + (1-i)^{2n} = 2^{n+1} \cos \frac{n\pi}{2}$ .
19. If  $\cos\alpha + \cos\beta + \cos\gamma = 0 = \sin\alpha + \sin\beta + \sin\gamma$  then show that  
 i)  $\cos 3\alpha + \cos 3\beta + \cos 3\gamma = 3 \cos(\alpha + \beta + \gamma)$   
 ii)  $\sin 3\alpha + \sin 3\beta + \sin 3\gamma = 3 \sin(\alpha + \beta + \gamma)$
20. If  $n \in \mathbb{N}$ , then show that  $(p+iq)^{1/n} + (p-iq)^{1/n} = 2(p^2+q^2)^{1/2n} \cos\left(\frac{1}{n} \tan^{-1} \frac{q}{p}\right)$ .
21. Solve  $(x-1)^n = x^n$  (n is positive integer).
22. Solve  $3x^3 - 26x^2 + 52x - 24 = 0$  given that the roots are in GP.
23. Solve  $x^4 - 4x^2 + 8x + 35 = 0$ , given that  $2 + i\sqrt{3}$  is a root of the equation.
24. Given that two roots of  $4x^3 + 20x^2 - 23x + 6 = 0$  are equal, find all the roots of the given equation.

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