

**BOARD OF INTERMEDIATE EDUCATION – AP
GUNTUR, TADEPALLI**

HALF YEARLY EXAMINATIONS – 2021- 2022

**Mathematics – IIA
(English Version)**

Time : 3hr

Max.Marks : 75

Note: This question paper consists of 3 sections A,B and C

SECTION – A

10 x 2 = 20

I. Very short Answer type Questions..

- (i) Attempt All Questions
- (ii) Each question carries two marks

1. Find the multiplicative inverse of $7 + 24i$
2. Write $Z = -1 - i\sqrt{3}$ in the polar form
3. Find the real and imaginary parts of the complex number $\frac{a+ib}{a-ib}$
4. Find the value of $(1 - i)^8$
5. If α, β are the roots of the equation $x^2 + x + 1 = 0$, then prove that $\alpha^4 + \beta^4 + \alpha^{-1}\beta^{-1} = 0$
6. Find the nature of the roots of $3x^2 + 7x + 2 = 0$
7. If α, β, γ are the roots of $4x^3 - 6x^2 + 7x + 3 = 0$ then find the value of $\alpha\beta + \beta\gamma + \gamma\alpha$
8. Find the number of permutations that can be made by using all the letters of the word "INDEPENDENCE"
9. Find the number of ways of preparing a chain with six different coloured beads
10. Find the number of zero's in $100!$

SECTION – B

5 x 4 = 20

II. short Answer type Questions..

- (i) Attempt any FIVE Questions
- (ii) Each question carries Four marks

11. If $z = x + iy$ and if the point P in the argand plane represents z then describe geometrically the locus z satisfying the equation $|z - 3 + i| = 4$
12. If $z = 3 - 5i$ then show that $z^3 - 10z^2 + 58z - 136 = 0$
13. If the expression $\frac{x-p}{x^2 - 3x + 2}$ takes all real values for $x \in \mathbb{R}$ then find the bounds for p
14. If x_1, x_2 are the roots of the quadratic equation $ax^2 + bx + c = 0$ and $c \neq 0$, find the value of $(ax_1 + b)^2 + (ax_2 + b)^2$ in terms of a, b, c
15. If the letters of the word BRING are permuted in all possible ways and the words thus formed are arranged in the dictionary order, then find the 59th word.

16. Find the number of ways of arranging the letters of the word ASSOCIATIONS in how many of them (i) all the three 'S's come together.

17. Prove that $\frac{{}^{4n}C_{2n}}{{}^{2n}C_n} = \frac{1.3.5.....(4n-1)}{\{1.3.5.....(2n-1)\}^2}$

SECTION - C

5 x 7 = 35

III. Long Answer type Questions..

(i) Attempt any FIVE Questions

(ii) Each question carries Seven marks

18. If n is a positive integer show that $(P+iQ)^{\frac{1}{n}} + (P-iQ)^{\frac{1}{n}} = 2(P^2+Q^2)^{\frac{1}{2n}} \cos\left[\frac{1}{n} \tan^{-1} \frac{Q}{P}\right]$

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. Find all the roots of the equation $x^9 - x^5 + x^4 - 1 = 0$

21. If n is an integer then show that

$$(1 + \cos\theta + i\sin\theta)^n + (1 + \cos\theta - i\sin\theta)^n = 2^{n+1} \cos^n\left(\frac{\theta}{2}\right) \cos\left(\frac{n\theta}{2}\right)$$

22. Solve the equation $x^4 - 6x^3 + 11x^2 - 10x + 2 = 0$ given that $2 + \sqrt{3}$ is a root of the equation.

23. Solve $x^4 + x^3 - 16x^2 - 4x + 48 = 0$ given that the product of two of the roots is 6 (using the relation of the roots)

24. Solve $8x^3 - 36x^2 - 18x + 81 = 0$ given that the roots of this equation are in A.P