BOARD OF INTERMEDIATE EDUCATION (AP)

HALF YEARLY EXAMINATIONS - 2021

SENIOR INTER MATHEMATICS - IIA

MODEL PAPER (English Version)

Time: 3 Hours   **Max.Marks: 75**

SECTION - A

Note: i) Very short answer type questions.   **$10 \times 2 = 20$**

    ii) Answer All questions.

    iii) Each question carries Two marks.

1. Find the complex conjugate of $\dfrac{5i}{7 + i}$.

2. If $x + iy = \text{cis}\alpha.\text{cis}\beta$ then find the value of $x^2 + y^2$.

3. If $z_1 = -1, z_2 = -i$ then find $\text{Arg}(z_1 z_2)$.

4. If A, B, C are the angles of a triangle such that $x = \text{cis}A$, $y = \text{cis}B$, $z = \text{cis}C$ then find xyz.

5. If $1, \omega, \omega^2$ are cube roots of units, then find the value of $(1 - \omega + \omega^2)^5 + (1 + \omega - \omega^2)^5$.

6. If the equation $x^2 - 15 - m(2x - 8) = 0$ has equal roots. Find the value of m.

7. If $1, 1, \alpha$ are the roots of $x^3 - 6x^2 + 9x - 4 = 0$ then find 'α'.

8. Find the number of ways of arranging the letters of the word INTERMEDIATE.

9. If $^nP_r = 5040$, $^nC_r = 210$ then find n and r.

10. Find the number of positive divisors of 1080.

SECTION - B

Note: i) Short answer type questions.   **$5 \times 4 = 20$**

    ii) Answer any Five questions.

    iii) Each question carries Four marks.

11. If $x + iy = \dfrac{1}{1 + \cos\theta + i\sin\theta}$ then show that $4x^2 = 1$.

12. Show that the points in the argand plane represented by the complex number $-2 + 7i$, $-\dfrac{3}{2} + \dfrac{1}{2}i$, $4 - 3i$ and $\dfrac{7}{2}(1 + i)$ are the vertices of a rhombus.

13. If x is real, prove that $\dfrac{x}{x^2 - 5x + 9}$ lies between $-\dfrac{1}{11}$ and 1.

14. If the expression $\dfrac{x - p}{x^2 - 3x + 2}$ takes all real values of $x \in R$, then find the bounds for p.

15. Find the number of 4 letter words that can be formed using the letters of the word MIRACLE. How many of them (i) Begin with a vowel (ii) Begin and end with vowels (iii) End with a consonant?

16. If the letters of the words MASTER are permuted in all possible ways and the words thus formed are arranged in the dictionary order, then find the rank of the word MASTER.

17. Find the number of ways of selecting 11 member cricket team from 7 batsmen, 6 bowlers and 2 wicket keepers. So that the team contains 2 wicket keepers and atleast 4 bowlers.

SECTION - C

Note: i) Long answer type questions. $5 \times 7 = 35$

ii) Answer any Five questions.

iii) Each question carries Seven marks.

18. If α, β are the roots of $x^2 - 2x + 4 = 0$ then show that $\alpha^n + \beta^n = 2^{n+1} \cos \dfrac{n\pi}{3}$.

19. Show that one value of $\left(\dfrac{1 + \sin \dfrac{\pi}{8} + i \cos \dfrac{\pi}{8}}{1 + \sin \dfrac{\pi}{8} - i \cos \dfrac{\pi}{8}} \right)^{8/3}$ is -1.

20. If $\cos \alpha + \cos \beta + \cos \gamma = 0 = \sin \alpha + \sin \beta + \sin \gamma$ then prove that $\cos^2\alpha + \cos^2\beta + \cos^2\gamma = \dfrac{3}{2}$ $= \sin^2\alpha + \sin^2\beta + \sin^2\gamma$.

21. If 'n' is a positive integer then show that $(1 + i)^n + (1 - i)^n = 2^{\frac{n+2}{2}} \cos \dfrac{n\pi}{4}$.

22. Solve $18x^3 + 81x^2 + 121x + 60 = 0$ given that a root is equal to half of the sum of the remaining roots.

23. Given that one root of $2x^3 + 3x^2 - 8x + 3 = 0$ is the double the other root. Find the roots.

24. Solve $x^4 + x^3 - 16x^2 - 4x + 48 = 0$ given that the product of two roots is 6.

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