N K MATHS ACADEMY

TIRUPUR-98434 34491

UNIT TEST-2022-23

MATHEMATICS

UNIT TEST -2

12

MARKS: 40 **TIME: 1.00 HR**

I. CHOOSE THE BEST ANSWER: **8X1=8**

1. $i^n + i^{n+1} + i^{n+3}$ is

(1)0 (2)1 (3)-1 (4) i

2. The conjugate of a complex number is $\frac{1}{i-2}$, then the complex number is

(1) $\frac{1}{i+2}$ (2) $\frac{-1}{i+2}$ (3) $\frac{-1}{i-2}$ (4) $\frac{1}{i-2}$

3. If z is a non-zero complex number, such than $2iz^2 = \bar{z}$ then $|z|$ is

(1) $\frac{1}{2}$ (2)1 (3)2 (4)3

4. If $|z|$=1, then the value of $\frac{1+z}{1+\bar{z}}$ is

(1) z (2) $\bar{z}$ (3) $\frac{1}{z}$ (4)1

5. If $z = x + iy$ is a complex numbers such that $|z+2| = |z-2|$, then the locus of z is

(1) real axis (2)imaginary axis (3)ellipse (4)circle

6. The Principal argument of complex number $\frac{\left(1+i\sqrt{3}\right)^2}{4i\left(1-i\sqrt{3}\right)}$ is

(1) $\frac{2\pi}{3}$ (2) $\frac{\pi}{6}$ (3) $\frac{5\pi}{6}$ (4) $\frac{\pi}{2}$

7. If $x = \cos\theta + i\sin\theta$ then the value of $x^n + \frac{1}{x^n}$ is

(1) $2\cos n\theta$ (2) $2i\sin n\theta$ (3) $2\sin n\theta$ (4) $2i\cos n\theta$

8. If ω is the nth root of unity then

(1) $1+\omega^2+\omega^4+\ldots\ldots = \omega+\omega^3+\omega^5+\ldots\ldots$ (3) $\omega^n = 0$

(2) $\omega^n = 1$ (4) $\omega = \omega^{n-1}$

II. ANSWER ANY 4 QUESTIONS: **4X2=8**

9. If $(1+i)(1+2i)(1+3i)\ldots(1+ni)=x+iy$ show that $2.5.10\ldots(1+n^2)=x^2+y^2$

10. Find all the values of the following: $(i)^{\frac{1}{3}}$

11. If $z=5-2i$ and $w=-1+3i$, find $(z+w)^2$.

12. Write $\frac{3+4i}{5-12i}$ in the $x+iy$ form, hence find its real and imaginary part.

13. Find the squares root of $-5-12i$.

III. ANSWER ANY 3 QUESTIONS: **3X3=9**

14. Show that $\left(\frac{19+9i}{5-3i}\right)^{15}-\left(\frac{8+i}{1+2i}\right)^{15}$ is purely imaginary.

15. Prove that $|z_1+z_2|\le|z_1|+|z_2|$ (triangular inequality)

16. Show that the points $1,-\frac{1}{2}+i\frac{\sqrt{3}}{2},-\frac{1}{2}-i\frac{\sqrt{3}}{2}$ are the vertices of an equilateral triangle.

17. Obtain the Cartesian form of the locus $z=x+iy$ in $|z-4|=16$

18. If $\frac{1+z}{1-z}=\cos 2\theta+i\sin 2\theta$ show that $z=i\tan\theta$.

IV. ANSWER ANY 3 QUESTIONS: **3X5=15**

19. If z_1, z_2 and z_3 are three complex number such that $|z_1|=1,|z_2|=2,|z_3|=3$ and $|z_1+z_2+z_3|=1$, show that $|9z_1z_2+4z_1z_3+z_2z_3|=6$.

20. If $z=x+iy$ is a complex number such that $\text{Im}\left(\frac{2z+1}{iz+1}\right)=0$, show that locus of z is $2x^2+2y^2+x-2y=0$.

21. Suppose z_1, z_2 and z_3 are the vertices of an equilateral triangle inscribed in a circle $|z|=2$ .if $z_1=1+i\sqrt{3}$, then find z_2 and z_3

22. If P represents the variable complex number z, find the locus of P $\arg\left(\frac{z-1}{z+1}\right)=\frac{\pi}{3}$

23. Find all the values of $\left(\sqrt{3}+i\right)^{\frac{2}{3}}$