JEE MAIN PATTERN

Mathematics : COMPLEX NUMBER

Practice Paper – 01

1. If $\frac{z_2}{z_1}$ is imaginary, then $\left|\frac{2z_1+3z_2}{2z_1-3z_2}\right|$ is

(A) $\frac{2}{3}$ (B) 1 (C) $\frac{3}{2}$ (D) 5

2. If $(a+bi)^{11}$ = x + iy, where a, b, x, y $\in R$, then $(b + ai)^{11}$ equals

(A) y + ix (B) $-y-ix$ (C) $-x-iy$ (D) $x+iy$

3. If $z_k = \cos\left(\frac{k\pi}{10}\right)+i\sin\left(\frac{k\pi}{10}\right)$, then $z_1z_2z_3z_4$ is equal to

(A) –1 (B) 2 (C) –2 (D) 1

4. If $(a_1 + ib_1)(a_2 + ib_2) \ldots (a_n + ib_n) = A + iB$, then $\left(a_1^2+b_1^2\right)\left(a_2^2+b_2^2\right)\ldots\ldots\left(a_n^2+b_n^2\right)$ is equal to

(A) 1 (B) $(A^2 + B^2)$ (C) (A + B) (D) $\left(\frac{1}{A^2}+\frac{1}{B^2}\right)$

5. If ω is a complex cube root of unity, then the value of $\frac{a+b\omega+c\omega^2}{c+a\omega+b\omega^2}+\frac{a+b\omega+c\omega^2}{b+c\omega+a\omega^2}$ is

(A) 1 (B) 0 (C) 2 (D) –1

6. If $|z_1|=|z_2|$ and $\arg(z_1) + \arg(z_2) = 0$, then

(A) $z_1 = z_2$ (B) $z_1 = \bar{z}_2$ (C) $z_1z_2 = 1$ (D) None of these

7. If $z = 1 + i\tan\alpha$, where $\pi < \alpha < \frac{3\pi}{2}$, then |z| is equal to

(A) $\sec\alpha$ (B) $-\sec\alpha$ (C) $\operatorname{cosec}\alpha$ (D) None of these

8. If in polar form z_1 = cos α + i sin α, z_2 = cos β + i sin β, z_3 = cos γ + i sin γ and $z_1+z_2+z_3=0$, then $z_1^{-1}+z_2^{-1}+z_3^{-1}=$

(A) 1 (B) 0 (C) –1 (D) None of these

9. If $z=1+i\sqrt{3}$, then $|\arg(z)|+|\arg(\bar{z})|=$

(A) $\frac{\pi}{3}$ (B) $\frac{2\pi}{3}$ (C) 0 (D) $\frac{\pi}{2}$

10. If $|z_1-1|<1$, $|z_2-2|<2$, $|z_3-3|<3$, then $|z_1+z_2+z_3|$

(A) is less than 6 (B) is more than 3

(C) is less than 12 (D) lies between 6 and 12

11. $\sum_{n=1}^{100} i^n$ is equal to

(A) 1 (B) i (C) –i (D) 0

12. If α is the nth root of unity, then $1+2\alpha+3\alpha^2+\ldots\ldots$ to n terms equal to

(A) $\frac{-n}{(1-\alpha)^2}$ (B) $\frac{-n}{1-\alpha}$ (C) $\frac{-2n}{1-\alpha}$ (D) $\frac{-2n}{(1-\alpha)^2}$

13. If 1, ω, ω^2, ..., ω^{n-1} are nth roots of unity, then $(1-\omega)(1-\omega^2)\ldots\ldots(1-\omega^{n-1})$ is equal to

(A) n (B) 1 (C) 0 (D) n^2

14. ω is cube root of unity $(\omega\neq 1)$, then the value of $\omega^n+\omega^{n+1}+\omega^{n+2}$ is $(n\in N)$

(A) 0 (B) 1 (C) 2 (D) 3

15. The value of $\sum_{p=1}^{6} 2\left(\sin\frac{2p\pi}{7}-i\cos\frac{2p\pi}{7}\right)$ is

(A) 2i (B) –2i (C) 2 (D) 1

16. If α and β are different complex numbers with $|\beta|=1$, then $\left|\frac{\beta-\alpha}{1-\bar{\alpha}\beta}\right|$ is equal to

(A) 0 (B) $\frac{1}{2}$ (C) 1 (D) 2

17. For any two non-zero complex numbers z_1 and z_2 if $z_1\bar{z}_2+\bar{z}_1z_2=0$, then the difference of amplitudes of z_1 and z_2 is

(A) 0 (B) $\frac{\pi}{4}$ (C) $\frac{\pi}{2}$ (D) π

18. If $|z|\geq 5$ then the least value of $\left|z+\frac{2}{z}\right|$ is

(A) $\frac{23}{5}$ (B) $\frac{24}{5}$ (C) 5 (D) None of these

19. Let z be a purely imaginary number such that Im(z) < 0. Then arg(z) is equal to

(A) π (B) $\frac{\pi}{2}$ (C) 0 (D) $-\frac{\pi}{2}$

20. For any complex number z, maximum value of $|z| - |z - 1|$ is

(A) 0 (B) $\frac{1}{2}$ (C) 1 (D) $\frac{3}{2}$

21. If α, β are the roots of $x^2 + px + q = 0$, and ω is a cube root of unity, then value of $(\omega\alpha+\omega^2\beta)(\omega^2\alpha+\omega\beta)$ is

(A) p^2 (B) 3q (C) $p^2 - 2q$ (D) $p^2 - 3q$

22. If |z| = z + 3 – 2i, then z equals

(A) $\frac{7}{6}+i$ (B) $\frac{-7}{6}+2i$ (C) $\frac{-5}{6}+2i$ (D) $\frac{5}{6}+i$

23. If $\omega\ (\neq 1)$ is a cube root of unity and $(1+\omega^2)^{11}=a+b\omega+c\omega^2$, then (a, b, c) equals

(A) (1, 1, 0) (B) (0, 1, 1) (C) (1, 0, 1) (D) (1, 1, 1)

24. If $z=\left(\frac{1}{\sqrt{3}}+\frac{1}{2}i\right)^7+\left(\frac{1}{\sqrt{3}}-\frac{1}{2}i\right)^7$, then

(A) Re (z) = 0 (B) Im (z) = 0

(C) Re (z) > 0 , Im (z) < 0 (D) Re (z) < 0, Im (z) > 0

25. If $(\omega\neq 1)$ is a complex cube root of unity and $(1+\omega^4)^n=(1+\omega^8)^n$, then the least possible integral value of n is

(A) 2 (B) 3 (C) 6 (D) 12

26. If z = $\dfrac{1+\cos\theta+i\sin\theta}{\sin\theta+i(1+\cos\theta)}$ $\left(0<\theta<\dfrac{\pi}{2}\right)$ then |z| equals

(A) $2|\sin\theta|$ (B) $2|\cos\theta|$ (C) 1 (D) $\left|\cot\dfrac{\theta}{2}\right|$

27. If α $(\neq 1)$ is a fifth root of unity and β $(\neq 1)$ is a fourth root of unity, then

$z=(1+\alpha)(1+\beta)(1+\alpha^2)(1+\beta^2)(1+\alpha^3)(1+\beta^3)$ equals

(A) α (B) β (C) $\alpha\beta$ (D) 0

28. The number of complex numbers satisfying $\bar{z}=iz^2$ is

(A) 1 (B) 2 (C) 3 (D) 4

29. If $z^2 + z + 1 = 0$, where z is a complex number, then value of

$S=\left(z+\dfrac{1}{z}\right)^2+\left(z^2+\dfrac{1}{z^2}\right)^2+\left(z^3+\dfrac{1}{z^3}\right)^2+.......+\left(z^6+\dfrac{1}{z^6}\right)^2$ is

(A)12 (B) 18 (C) 54 (D) 6

30. If $z_1 + z_2 + z_3 = 0$ and $|z_1| = |z_2| = |z_3| = 1$, then value of $z_1^2+z_2^2+z_3^2$ equals

(A) –1 (B) 0 (C) 1 (D) 3