JEE MAIN : CHAPTER WISE TEST-11

SUBJECT :- MATHEMATICS **DATE...**
CLASS :- 11th **NAME...**
CHAPTER :- COMPLEX NUMBER **SECTION..**

(SECTION A)

1. The locus of the point whose position vector is given by $(a + ib)^5 + (b + ia)^5$ (where a, b are real parameters) is-
(A) $y = x$ (B) $y = -x$
(C) $y = mx, m \in R$ (D) not defined

2. If $\left(\frac{3-z_1}{2-z_1}\right)\left(\frac{2-z_2}{3-z_2}\right) = k$, then points $A(z_1)$, $B(z_2)$, $C(3, 0)$ and $D(2, 0)$ (taken in clockwise sense) will
(A) lie on a circle only for $k > 0$
(B) lie on a circle only for $k < 0$
(C) lie on a circle $\forall\ k \in R$
(D) be the vertices of a square $\forall\ k \in (0, 1)$

3. A and B represent the complex numbers $1 + ai$ and $3 + bi$ and ΔOAB is an isosceles triangle right- angled at A. Then the values of a and b can be-
(A) $a = 2, b = -1$ (B) $a = 1, b = -2$
(C) $a = 2, b = 1$ (D) $a = 2, b = -2$

4. If the imaginary part of the expression $\frac{z-1}{e^{\theta i}} + \frac{e^{\theta i}}{z-1}$ be zero, then the locus of z is –
(A) a straight line parallel to x-axis
(B) a parabola
(C) a circle of radius 1
(D) None of these

5. The lines $\vec{r} = i - j + \lambda(2i + k)$ and $\vec{r} = (2i - j) + \mu(i + j - k)$ intersect for
(A) $\lambda = 1, \mu = 1$
(B) $\lambda = 2, \mu = 3$
(C) all values of λ and μ
(D) no value of λ and μ

6. The plane $2x - y + 3z + 5 = 0$ is rotated through 90º about its line of intersection with the plane $5x - 4y + 2z + 1 = 0$. The equation of the plane in the new position is
(A) $6x - 9y - 29z - 31 = 0$
(B) $27x - 24y - 26z - 13 = 0$
(C) $43x - 32y - 2z + 27 = 0$
(D) $26x - 43y - 151z - 165 = 0$

7. If $\left|z - \frac{2}{z}\right| = 2$, then the greatest value of $|z|$ is
(A) $1 + \sqrt{2}$ (B) $2 + \sqrt{2}$
(C) $\sqrt{3} + 1$ (D) $\sqrt{5} + 1$

8. The greatest and the least value of $|z_1 + z_2|$ if $z_1 = 24 + 7i$ and $|z_2| = 6$ are respectively
(A) 31, 19 (B) 25, 19
(C) 31, 25 (D) None of these

9. If $\alpha, \beta, \gamma, \delta$ are four complex numbers such that $\frac{\gamma}{\delta}$ is real and $\alpha\delta - \beta\gamma \neq 0$, then $z = \frac{\alpha+\beta t}{\gamma+\delta t}$, $t \in R$ represents a
(A) circle (B) parabola
(C) ellipse (D) straight line

10. If α and β are roots of the equation $ax^2 + bx + c = 0$ then roots of the equation $a(2x + 1)^2 - b(2x + 1)(3 - x) + c(3 - x)^2 = 0$ are:
(A) $\frac{2\alpha+1}{\alpha-3}, \frac{2\beta+1}{\beta-3}$ (B) $\frac{3\alpha+1}{\alpha-2}, \frac{3\beta+1}{\beta-2}$
(C) $\frac{2\alpha-1}{\alpha-2}, \frac{2\beta+1}{\beta-2}$ (D) None of these

11. Let z, w be two non zero complex number such that $|z| = |w|$ & $\arg(z) + \arg(w) = \pi$ then $z =$
(A) $\overline{w}$ (B) $-\overline{w}$
(C) w (D) – w

12. Equation of tangent drawn to circle $|z| = r$ at the point $A(z_0)$ is
(A) $R_e\left(\frac{z}{z_0}\right) = 1$ (B) $R_e\left(\frac{z_0}{z}\right) = 1$
(C) $\text{Im}\left(\frac{z}{z_0}\right) = 1$ (D) $\text{Im}\left(\frac{z_0}{z}\right) = 1$

13. The locus of the centre of a circle, which touches the circles $|z - z_1| = a$ and $|z - z_2| = b$ externally will be -
(A) an ellipse (B) a hyperbola
(C) a circle (D) None of these

14. The relation between the real numbers a and b, which satisfy the equation $\frac{1-ix}{1+ix}$ = a –ib, for some real value of x, is

(A) (a – b) (a + b) = 1 (B) $\left(\frac{a-b}{a+b}\right)$=1

(C) $a^2 + b^2 = 1$ (D) None of these

15. In the above question the maximum value of ∠PAB + ∠PBC + ∠PCD + ∠PDA is equal to-

(A) $\frac{3\pi}{4}$ (B) $\frac{\pi}{4}$ (C) $\frac{5\pi}{4}$ (D) $\frac{\pi}{2}$

16. If there exists an Z satisfying both |Z –mi| = m + 5 and |Z–4| < 3, then the set of all permissible values of m belong to the set -

(A) (–3, 3) (B) (–3, 9)
(C) (–5, –3) (D) (4, 9)

17. The number of 15th roots of unity which are also the 25th root of unity is :

(A) 3 (B) 5
(C) 10 (D) none of these

18. If 2 cos θ = x + $\frac{1}{x}$ and 2 cos φ = y + $\frac{1}{y}$, then $\frac{x}{y}$ + $\frac{y}{x}$ equals

(A) 2 cos (θ –φ) (B) 2 cos (θ + φ)
(C) 2 sin (θ – φ) (D) 2 sin (θ + φ)

19. If Z is a point on the circle |Z –1|= 1, then $\frac{Z-2}{Z}$ equals

(A) i tan (arg Z) (B) i cot (arg Z)
(C) i tan (arg (Z –1)) (D) i cot (arg (Z –1))

20. Let $Z_i = r_i (\cos\theta_i + i\sin\theta_i)$, i = 1, 2, 3 and $\frac{1}{Z_1} + \frac{1}{Z_2} + \frac{1}{Z_3} = 0$. Consider the ΔABC formed by $\frac{\cos 2\theta_1 + i\sin 2\theta_1}{Z_1}$, $\frac{\cos 2\theta_2 + i\sin 2\theta_2}{Z_2}$, $\frac{\cos 2\theta_3 + i\sin 2\theta_3}{Z_3}$.

Then the complex number 0 lies

(A) on the side BC
(B) outside the triangle
(C) inside the triangle
(D) on the side CA

(SECTION B)

21. Two lines $zi - \bar{z}i + 2 = 0$ and $z(1+i) + \bar{z}(1-i) + 2 = 0$ intersect at a point P. Find the sum of minimum and maximum modulus of complex number of a point on second line which is at a distance of 2 units from point P.

22. If z is a complex number and the minimum value of |z| + |z – 1| + |2z – 3| is λ and if y = 2[x] + 3 =3[x – λ]. Then find the value of [x + y] (where [.] denotes the greatest integer function)

23. If $\alpha = e^{\frac{2\pi i}{7}}$ and $f(x) = A_0 + \sum_{k=1}^{20} A_k x^k$,then the value of $\sum_{r=0}^{6} f(\alpha^r x) = n(A_0 + A_n x^n + A_{2n} x^{2n})$, then find the value of n.

24. If $\left|\frac{z_1 - 3z_2}{3 - z_1\bar{z}_2}\right|$ = 1 and | z_2 | ≠ 1, then | z_1 | is equal to

25. Let z = $\frac{(2\sqrt{3}+2i)^8}{(1-i)^6} + \frac{(1+i)^6}{(2\sqrt{3}-2i)^8}$. Let θ be the argument of z such that θ∈ (– π, π] then 4 sinθ is equal to

26. If z_1 is the complex number satisfying z + $\sqrt{2}$ | z + 1| + i = 0 and real part of e^{iz_1} is e^a cosb, where a, b ∈ N, then a + b is equal to

27. Let |z| = 2 & w = $\frac{z+1}{z-1}$ where z, w ∈ C. If M and m are greatest and least modulus value of w then find $\left[\frac{M}{m}\right]$, where [ ] → greatest integer function.

28. If $x_r = \cos\frac{\pi}{2^r} + i\sin\frac{\pi}{2^r}$, $z_t = \cos\frac{\pi}{3^t} + i\sin\frac{\pi}{3^t}$ r = 1, 2, 3, …., t = 1, 2, 3, …. The value of ($x_1 x_2 x_3$ …..

29. If a = cos α + i sin α, b = cos β + i sin β, c = cos γ + i sin γ and $\frac{a}{b} + \frac{b}{c} + \frac{c}{a}$ = 1, then cos (α – β) + cos (β – γ) + cos (γ – α) =

30. If $x^2 - x + 1 = 0$, then the value of $\sum_{n=1}^{5}\left(x^n + \frac{1}{x^n}\right)^2$ is -