Q1 - 24 June - Shift 1

Let $A = \{z \in C : 1 \le |z - (1+i)| \le 2\}$ and $B = \{z \in A : |z - (1-i)| = 1\}$. Then, B :

(A) is an empty set

(B) contains exactly two elements

(C) contains exactly three elements

(D) is an infinite set

Space for your notes:

Q2 - 24 June - Shift 2

Let $S = \{z \in \mathbb{C} : |z-3| \le 1 \text{ and } z(4+3i) + \bar{z}(4-3i) \le 24\}$. If $\alpha + i\beta$ is the point in S which is closest to 4i, then $25(\alpha + \beta)$ is equal to ______.

Space for your notes:

Q3 - 25 June - Shift 1

Let a circle C in complex plane pass tltrough the points $z_1 = 3 + 4i$, $z_2 = 4 + 3i$ and $z_3 = 5i$. If $z(\ne z_1)$ is a point on C such that the line through z and z_1 is perpendicular to the line through z_2 and z_3, then arg(z) is equal to :

(A) $\tan^{-1}\left(\frac{2}{\sqrt{5}}\right) - \pi$ (B) $\tan^{-1}\left(\frac{24}{7}\right) - \pi$

(C) $\tan^{-1}(3) - \pi$ (D) $\tan^{-1}\left(\frac{3}{4}\right) - \pi$

Space for your notes:

Q4 - 25 June - Shift 2

Let z_1 and z_2 be two complex numbers such that

$\overline{z}_1 = i\overline{z}_2$ and $\arg\left(\frac{z_1}{\overline{z}_2}\right) = \pi$. Then

(A) $\arg z_2 = \frac{\pi}{4}$ (B) $\arg z_2 = -\frac{3\pi}{4}$

(C) $\arg z_1 = \frac{\pi}{4}$ (D) $\arg z_1 = -\frac{3\pi}{4}$

Space for your notes:

Q5 - 26 June - Shift 1

Let $A = \left\{z \in C : \left|\frac{z+1}{z-1}\right| < 1\right\}$

and $B = \left\{z \in C : \arg\left(\frac{z-1}{z+1}\right) = \frac{2\pi}{3}\right\}$.

Then $A \cap B$ is :

(A) a portion of a circle centred at $\left(0, -\frac{1}{\sqrt{3}}\right)$ that lies in the second and third quadrants only

(B) a portion of a circle centred at $\left(0, -\frac{1}{\sqrt{3}}\right)$ that lies in the second quadrant only

(C) an empty set

(D) a portion of a circle of radius $\frac{2}{\sqrt{3}}$ that lies in the third quadrant only

Space for your notes:

Q6 - 26 June - Shift 2

If $z^2 + z + 1 = 0$, $z \in \mathbb{C}$, then $\left|\sum_{n=1}^{15}\left(Z^n + (-1)^n \frac{1}{Z^n}\right)^2\right|$ is equal to _______ .

Space for your notes:

Q7 - 27 June - Shift 1

The area of the polygon, whose vertices are the non-real roots of the equation $\bar{z} = iz^2$ is :

(A) $\frac{3\sqrt{3}}{4}$ (B) $\frac{3\sqrt{3}}{2}$

(C) $\frac{3}{2}$ (D) $\frac{3}{4}$

Space for your notes:

Q8 - 27 June - Shift 2

The number of points of intersection of $|z - (4 + 3i)| = 2$ and $|z| + |z - 4| = 6$, $z \in C$ is :

(A) 0 (B) 1

(C) 2 (D) 3

Space for your notes:

Q9 - 28 June - Shift 1

The number of elements in the set

$\{z = a + ib \in \mathbb{C} : a, b \in \mathbb{Z} \text{ and } 1 < |z - 3 + 2i| < 4\}$ is _______.

Space for your notes:

Q10 - 28 June - Shift 2

Sum of squares of modulus of all the complex numbers z satisfying $\bar{z} = iz^2 + z^2 - z$ is equal to

Space for your notes:

Q11 - 29 June - Shift 1

Let α and β be the roots of the equation $x^2 + (2i - 1) = 0$. Then, the value of $|\alpha^8 + \beta^8|$ is equal to :

(A) 50 (B) 250

(C) 1250 (D) 1500

Space for your notes:

Q12 - 29 June - Shift 1

Let $S = \{z \in \mathbb{C} : |z - 2| \leq 1, z(1 + i) + \bar{z}(1 - i) \leq 2\}$. Let $|z - 4i|$ attains minimum and maximum values, respectively, at $z_1 \in S$ and $z_2 \in S$. If $5(|z_1|^2 + |z_2|^2) = \alpha + \beta\sqrt{5}$, where α and β are integers, then the value of $\alpha + \beta$ is equal to ______.

Space for your notes:

Q13 - 29 June - Shift 2

Let arg (z) represent the principal argument of the complex number z. The, $|z| = 3$ and $\arg(z - 1) - \arg(z + 1) = \frac{\pi}{4}$ intersect:

(A) Exactly at one point

(B) Exactly at two points

(C) Nowhere

(D) At infinitely many points.

Space for your notes:

Answer Key

Q1 (D)	**Q2** (80)	**Q3** (B)	**Q4** (C)
Q5 (B)	**Q6** (2)	**Q7** (A)	**Q8** (C)
Q9 (40)	**Q10** (2)	**Q11** (A)	**Q12** (26)
Q13 (C)			

Q1 - 25 July - Shift 1

If $\alpha, \beta, \gamma, \delta$ are the roots of the equation $x^4 + x^3 + x^2 + x + 1 = 0$, then

$\alpha^{2021} + \beta^{2021} + \gamma^{2021} + \delta^{2021}$ is equal to .

(A) -4 (B) -1

(C) 1 (D) 4

Space for your notes:

Q2 - 25 July - Shift 1

For $n \in N$, let $S_n = \left\{z \in C : |z - 3 + 2i| = \frac{n}{4}\right\}$ and

$T_n = \left\{z \in C : |z - 2 + 3i| = \frac{1}{n}\right\}$.

Then the number of elements in the set

$\{n \in N : S_n \cap T_n = \phi\}$ is :

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

Space for your notes:

Q3 - 25 July - Shift 2

For $z \in \mathbb{C}$ if the minimum value of $\left(|z - 3\sqrt{2}| + |z - p\sqrt{2}i|\right)$ is $5\sqrt{2}$, then a value of p is ______________

(A) 3 (B) $\frac{7}{2}$

(C) 4 (D) $\frac{9}{2}$

Space for your notes:

Q4 - 26 July - Shift 1

Let O be the origin and A be the point $z_1 = 1 + 2i$. If B is the point z_2, $\text{Re}(z_2) < 0$, such that OAB is a right angled isosceles triangle with OB as hypotenuse, then which of the following is NOT true ?

(A) $\arg z_2 = \pi - \tan^{-1} 3$

(B) $\arg (z_1 - 2z_2) = -\tan^{-1} \frac{4}{3}$

(C) $|z_2| = \sqrt{10}$

(D) $|2z_1 - z_2| = 5$

Space for your notes:

Q5 - 26 July - Shift 2

If $z = x + iy$ satisfies $|z| - 2 = 0$ and $|z-i|-|z+5i|=0$, then

(A) $x + 2y - 4 = 0$ (B) $x^2 + y - 4 = 0$

(C) $x + 2y + 4 = 0$ (D) $x^2 - y + 3 = 0$

Space for your notes:

Q6 - 27 July - Shift 1

Let the minimum value v_0 of $v = |z|^2 + |z-3|^2 + |z-6i|^2$, $z \in \mathbb{C}$ is attained at $z = z_0$. Then $\left|2z_0^2 - \bar{z}_0^3 + 3\right|^2 + v_0^2$ is equal to

(A) 1000 (B) 1024

(C) 1105 (D) 1196

Space for your notes:

Q7 - 27 July - Shift 1

Let $S=\{z\in\mathbb{C}:z^2+\bar{z}=0\}$. Then $\sum_{z\in S}(\mathrm{Re}(z)+\mathrm{Im}(z))$ is equal to ______.

Space for your notes:

Q8 - 27 July - Shift 2

Let S be the set of all (α,β), $\pi<\alpha,\beta<2\pi$, for which the complex number $\frac{1-i\sin\alpha}{1+2i\sin\alpha}$ is purely imaginary and $\frac{1+i\cos\beta}{1-2i\cos\beta}$ is purely real. Let $Z_{\alpha\beta}=\sin 2\alpha+i\cos 2\beta,(\alpha,\beta)\in S$.

Then $\sum_{(\alpha,\beta)\in S}\left(iZ_{\alpha\beta}+\frac{1}{i\bar{Z}_{\alpha\beta}}\right)$ is equal to :

(A) 3 (B) 3 i

(C) 1 (D) 2 – i

Space for your notes:

Q9 - 28 July - Shift 1

Let $S_1=\left\{z_1\in C:|z_1-3|=\frac{1}{2}\right\}$ and $S_2=\{z_2\in C:|z_2-|z_2+1||=|z_2+|z_2-1||\}$. Then, for $z_1\in S_1$ and $z_2\in S_2$, the least value of $|z_2-z_1|$ is :

(A) 0 (B) $\frac{1}{2}$ (C) $\frac{3}{2}$ (D) $\frac{5}{2}$

Space for your notes:

Q10 - 28 July - Shift 2

Let $z = a + ib, b \neq 0$ be complex numbers satisfying $z^2 = \bar{z} \cdot 2^{1-|z|}$. Then the least value of $n \in N$, such that $z^n = (z+1)^n$, is equal to ______

Space for your notes:

Q11 - 29 July - Shift 1

If $z = 2 + 3i$, then $z^5 + (\bar{z})^5$ is equal to :

(A) 244 (B) 224

(C) 245 (D) 265

Space for your notes:

Q12 - 29 July - Shift 2

If $z \neq 0$ be a complex number such that $\left|z - \frac{1}{z}\right| = 2$, then the maximum value of $|z|$ is:

(A) $\sqrt{2}$ (B) 1

(C) $\sqrt{2} - 1$ (D) $\sqrt{2} + 1$

Space for your notes:

Q13 - 29 July - Shift 2

Let $S = \{z = x + iy : |z - 1 + i| \geq |z|, |z| < 2, |z + i| = |z - 1|\}$. Then the set of all values of x, for which $w = 2x + iy \in S$ for some $y \in \mathbb{R}$, is

(A) $\left(-\sqrt{2}, \frac{1}{2\sqrt{2}}\right]$ (B) $\left(-\frac{1}{\sqrt{2}}, \frac{1}{4}\right]$

(C) $\left(-\sqrt{2}, \frac{1}{2}\right]$ (D) $\left(-\frac{1}{\sqrt{2}}, \frac{1}{2\sqrt{2}}\right]$

Space for your notes:

Answer Key

Q1 (B)	**Q2** (D)	**Q3** (C)	**Q4** (D)
Q5 (C)	**Q6** (A)	**Q7** (0)	**Q8** (C)
Q9 (C)	**Q10** (6)	**Q11** (A)	**Q12** (D)
Q13 (B)			