MATHEMATICS

DPP

DAILY PRACTICE PROBLEMS

DPP No. 36

Total Marks : 56

Max. Time : 59 min.

Topic : Complex Number

Type of Questions		**M.M., Min.**
Single choice Objective (no negative marking) Q. 1,2,3,4,5,6	**(3 marks, 3 min.)**	**[18, 18]**
Multiple choice objective (no negative marking) Q.7, 8	**(5 marks, 4 min.)**	**[10, 8]**
Subjective Questions (no negative marking) Q. 9,10,11,12,14	**(4 marks, 5 min.)**	**[20, 25]**
Match the Following (no negative marking) Q.13	**(8 marks, 8 min.)**	**[8, 8]**

1. The number of complex numbers z such that $|z - 1| = |z + 1| = |z - i|$ equals

(A) 1 (B) 2 (C) ∞ (D) 0

2. If α and β are the roots of the equation $x^2 - x + 1 = 0$, then $\alpha^{2009} + \beta^{2009} =$

(A) -1 (B) 1 (C) 2 (D) -2

3. If ω be an imaginary cube root of unity, then the number :
$(1 - \omega - \omega^2)^3 + (\omega - 1 - \omega^2)^3 + (\omega^2 - \omega - 1)^3$ is:

(A) divisible by 3 but not by 8
(B) divisible by 8 but not by 3
(C) divisible by both 3 & 8
(D) none of these

4. If the imaginary part of the expression $\frac{z-1}{e^{i\theta}} + \frac{e^{i\theta}}{z-1}$ 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) a straight line passing through (1, 0)

5. The reflection of the complex number $(2 - i)$ in the straight line $iz = \bar{z}$ is

(A) $4 - 3i$ (B) $3 + 4i$ (C) $2 + i$ (D) $1 - 2i$

6. If z_1, z_2, z_3, z_4 are imaginary 5th roots of unity, then the value of $\sum_{r=1}^{16}(z_1^r + z_2^r + z_3^r + z_4^r)$, is

(A) 0 (B) -1 (C) 20 (D) 19

7. If z_1 and z_2 are two complex numbers satisfying the equation

$\left|\frac{z_1 + z_2}{z_1 - z_2}\right| = 1$ then z_1/z_2 is a number which is

(A) positive real (B) negative real (C) imaginary (D) purely imaginary

8. The complex number z satisfying $|z + \bar{z}| + |z - \bar{z}| = 2$ and $|iz - 1| + |z - i| = 2$ is/are

(A) i (B) $-i$ (C) $\frac{1}{i}$ (D) $\frac{1}{i^3}$

9. Compute the product , $\left[1+\left(\frac{1+i}{2}\right)\right]\left[1+\left(\frac{1+i}{2}\right)^{2}\right]\left[1+\left(\frac{1+i}{2}\right)^{2^2}\right]......\left[1+\left(\frac{1+i}{2}\right)^{2^n}\right]$ where $n \geq 2$

10. Let A and B be two complex numbers such that $\frac{A}{B}+\frac{B}{A} = 1$, then prove that the origin and the two points represented by A and B form vertices of an equilateral triangle.

11. Find the equation of line joining the points (1 + i) and 2 – i in complex plane.

12. Let $z_1 = 10 + 6i$ and $z_2 = 4 + 2i$ be two complex nubmers and z be a complex number such that $\arg\left(\frac{z-z_1}{z-z_2}\right) = \frac{\pi}{4}$. Find the centre and radius of the locus of complex number z.

13. **Match the column :**

Column- I		**Column-II**	
(A)	If ω_1, ω_2 be imaginary cube roots of unity, then $\omega_1^4 + \omega_2^4$ is equal to	(p)	$-\frac{1}{\omega_1\omega_2}$
(B)	If $\omega \neq 1$ be nth roots of unity, then $\omega + \omega^2 + \omega^3 + ... + \omega^{n-1}$ is equal to	(q)	–1
(C)	If z_1 and z_2 be two nth roots of unity, then $\arg\left(\frac{z_1}{z_2}\right)$ is a multiple of	(r)	$\frac{2\pi}{n}$
(D)	If $\omega \neq 1$ be nth roots of unity, then value of $(1-\omega)(1-\omega^2)........(1-\omega^{n-1})$ is equal to	(s)	n

14. Draw the locus of z :

(i) $\arg(z - 1 + i) \leq -\frac{\pi}{3}$

(ii) $|z + 1 - i| = |z - 2|$

(iii) $|z| \leq 1$ and $-\frac{\pi}{4} \leq \arg(z) \leq \frac{\pi}{4}$

(iv) $\arg\left(\frac{z+i}{z-i}\right) = \frac{2\pi}{3}$

Answers Key

1. (A) **2.** (B) **3.** (C) **4.** (C)

5. (D) **6.** (B) **7.** (C)(D)

8. (A)(B)(C)(D) **9.** $\left(1-\frac{1}{2^{2^n}}\right)$ (1 + i)

11. $z(1+2i) - \bar{z}(1-2i) - 6i = 0$

12. centre: 9 + i, radius = $\sqrt{26}$

13. (A) $\rightarrow$ (p,q), (B) $\rightarrow$ (p,q), (C) $\rightarrow$ (r), (D) $\rightarrow$ (s)