**Complex Numbers**

**Integer Type / Fill in the Blanks**

1. For any integer k, let  where . The value of the expression  is **[2015]**

2. The value of the expression : 1.(2 - ω)(2 – ω2) + 2.(3 - ω)(3 – ω2) + .. + (n - 1)(n - ω)(n – ω2), where ω is an imaginary cube root of unity is \_\_\_\_\_\_\_. **[1996]**

3. Suppose z1, z2, z3 are the vertices of an equilateral triangle inscribed in the circle |z| = 2. If , then z2 = \_\_\_\_\_\_\_\_\_ and z3 = \_\_\_\_\_\_\_\_\_\_. **[1994]**

4. ABCD is a rhombus. Its diagonal AC and BD intersect at the point M and satisfy BD = 2AC. If the points D and M represent the complex numbers 1 + i and 2 – i respectively. Then A represents the complex numbers \_\_\_\_\_\_\_ or \_\_\_\_\_\_\_. **[1993]**

5. If α , β , γ are the cube roots of p, p < 0, then for any x, y and z,  = \_\_\_\_\_\_. **[1989]**

6. If a and b are real numbers between 0 and 1 such that points z1 = a + i, z2 = 1 + bi and z3 = 0 form an equilateral triangle, then a = \_\_\_\_\_\_\_ and b = \_\_\_\_\_\_\_ **[1989]**

7. For any two complex numbers z1, z2 and any real numbers a and b; |az1 – bz2|2 + |bz1 + az2|2 = \_\_\_\_\_\_\_\_. **[1988]**

8. If the expression  is real, then the set of all possible values of x is \_\_\_\_\_\_\_\_\_. **[1987]**

**True/False**

1. The cube root of unity when represented on the Argand diagram from the vertices of an equilateral triangle (T/F) **[1988]**

2. If three complex numbers are in A.P. then they lie on a circle in the complex plane. (T/F)

**[1985]**

3. If the complex numbers Z1, Z2 and Z3 represent the vertices of an equilateral triangle such that

|Z1| = |Z2| = |Z3| then Z1 + Z2 + Z3 = 0. **[1984]**

**MCQ- Single Correct (lvl 2)**

1. Let complex numbers α and lie on circles  and , respectively. If  satisfies the equation 2|z0|2 = r2 +2, then |α| =

(1)  (2) ½

(3)  (4) 1/3 **[2013]**

2. Let z be a complex number such that the imaginary part of z is nonzero and a = z2 + z + 1 is real. Then a cannot take the value

(1) -1 (2) 1/3

(3) ½ (4) ¾ **[2012]**

3. Let z = x + iy be a complex number where x and y are integers. Then the area of the rectangle whose vertices are the roots of the equation  is

(1) 48 (2) 32

(3) 40 (4) 80 **[2009]**

4. Let z = cosθ + isinθ. Then the value of  at θ = 2o is

(1)  (2) 

(3)  (4)  **[2009]**

5. A particle P starts from the point zo = 1 + 2i , where . It moves first horizontally away from origin by 5 units and then vertically away from origin by 3 units to reach a point z1 . From z1 the particle moves  units in the direction of the vector and then it moves through an angle π/2 in anticlockwise direction on a circle with centre at origin, to reach a point z2. The point z2 is given by

(1) 6 + 7i (2) -7 + 6i

(3) 7 + 6i (4) -6 + 7i **[2008]**

6. A man walks a distance of 3 units from the origin towards the north-east ( N 45o E ) direction. From there, he walks a distance of 4 units towards the north-west ( N 45o W) direction to reach a point P. Then the position of P in the Argand Plane is

(1)  (2) 

(3)  (4)  **[2007]**

7. If |z| = 1 and z ≠ ± 1 , then all the values of  lie on

(1) a line not passing through the origin (2) |z| = 

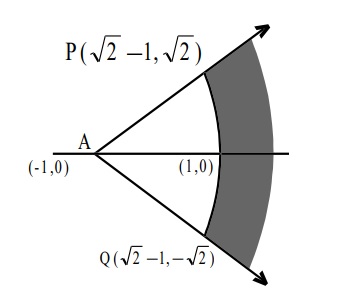
(3) the x-axis (4) the y-axis **[2007]**

8. If , where β ≠ 0 and z ≠ 1, satisfies the condition that  is purely real, then the set of values of z is

(1) { z : |z| = 1 } (2) { z : z = }

(3) { z : z ≠ 1 } (4) { z : |z| = 1, z ≠ 1 } **[2006]**

9. The locus of z which lies in shaded region is best represented by



(1) z : | z + 1 | > 2 , |arg(z + 1)| < π/4

(2) z : | z – 1 | > 2 , |arg(z - 1)| < π/4

(3) z : | z + 1 | < 2, | arg(z + 1) | < π/2

(4) z : | z - 1| < 2 , | arg(z – 1) | < π/2 **[2005]**

10. If a, b, c are integers not all equal and w is a cube root of unity (w ≠ 1), then the minimum value of | a + bw + cw2 | is

(1) 0 (2) 1

(3)  (4)  **[2005]**

11. If ω (≠1) be a cube root of unity and , then the least positive value of n is

(1) 2 (2) 3

(3) 5 (4) 6 **[2004]**

12. If |z| = 1 and  (where z ≠ - 1) , then Re(ω) is

(1) 0 (2) 

(3)  (4)  **[2003]**

13. For all complex numbers z1, z2 satisfying |z1| = 12 and |z2 – 3 – 4i| = 5, the minimum value of |z1 – z2| is

(1) 0 (2) 2

(3) 7 (4) 17 **[2002]**

14. Let 0 < α < π/2 be a fixed angle. If P = (cosθ, sinθ) and Q = (cos(α-θ),sin(α-θ)) then Q is obtained from P by

(1) clockwise rotation around origin through an angle α

(2) anticlockwise rotation around origin through an angle α

(3) reflection in the line through origin with slope tan α

(4) reflection in the line through origin with slope tan α/2 **[2002]**

15. The complex numbers z1, z2 and z3 satisfying  are the vertices of a triangle which is

(1) of area zero (2) right angled isosceles

(3) equilateral (4) obtuse angled isosceles **[2001]**

16. Let z1 and z2 be nth roots of unity which subtend a right angle at the origin. Then n must be of the form

(1) 4k + 1 (2) 4k + 2

(3) 4k + 3 (4) 4k **[2001]**

17. If arg z < 0, then arg(-z) – argz =

(1) π (2) -π

(3) -π/2 (4) π/2 **[2000]**

18. If z1, z2 and z3 are complex numbers such that |z1| = |z2| = |z3| = = 1. Then  is

(1) equal to 1 (2) less than 1

(3) greater than 3 (4) equal to 3 **[2000]**

19. If  , then  is equal to

(1)  (2) 

(3)  (4)  **[1999]**

20. If ω is an imaginary cube root of unity, then  equals

(1) 128ω (2) -128ω

(3) 128ω2 (4) -128ω2 **[1998]**

21. The value of the sum  where , equals

(1) i (2) i -1

(3) -i (4) 0 **[1998]**

22. For positive integers, the value of the expression :

, where , is a real number if :

(1) n1 = n2 + 1 (2) n1 = n2 – 1

(3) n1 = n2 (4) n1 > 0 , n2 > 0 **[1996]**

23. If ω (≠1) is a cube root of unity and , then A and B are respectively the numbers

(1) 0, 1 (2) 1, 1

(3) 1, 0 (4) -1, 1 **[1995]**

24. Let z and w be two non zero complex numbers such that |z| = |w| and arg z + arg w = π, then z equals

(1) w (2) -w

(3)  (4)  **[1995]**

25. Let z and w be two non zero complex numbers such that |z| ≤ 1, |w| ≤ 1 and |z + iw| =  = 2 , then z equals :

(1) 1 or i (2) i or – i

(3) 1 or -1 (4) i or -1 **[1995]**

26. If (ω ≠ 1) is a cube root of unity then  is equal to

(1) 0 (2) 1

(3) i (4) ω **[1995]**

27. The complex numbers sin x + i cos 2x and cos x – i sin 2x are conjugate to each other, for :

(1) x = nπ (2) 

(3) x = 0 (4) no value of x **[1988]**

28. If z1 and z2 are two non-zero complex numbers such that |z1 + z2| = |z1| + |z2| then arg z1 – arg z2 is equal to

(1) - π (2) -π/2

(3) 0 (4) π/2

(5) π **[1987]**