**Complex Numbers**

**Choose the most appropriate option (a, b, c or d).**

Q 1. If a < 0, b > 0 then is equal to

(a)  (b)  (c)  (d) none of these

Q 2. The value of the sum , where , is

(a) i (b) i – 1 (c) –i (d) 0

Q 3. If n1, n2 are positive integers then



is a real number if and only if

(a) n1 = n2 + 1 (b) n1 + 1 = n2 (c) n1= n2 (d) n1, n2are any two positive integers

Q 4. The complex number , 

(a) 0 (b) 2 (c) {1 + (-1)n} . in (d) none of these

Q 5. The smallest positive integral value of n for which is purely imaginary with positive imaginary part, is

(a) 1 (b) 3 (c) 5 (d) none of these

Q 6. If (a + ib)5 + α + iβ then (b + ia)5 is equal to

(a) β + iα (b) α - iβ (c) β - iα (d) -α - iβ

Q 7. If , the number of values of in + i-n for different n ∈ is

(a) 3 (b) 2 (c) 4 (d) 1

Q 8. Im(z) is equal to

(a)  (b)  (c)  (d) none of these

Q 9. The value of (1 + i)3 + (1 – i)6 is

(a) i (b) 2(-1 + 5i) (c) 1 – 5i (d) none of these

Q 10. Taking the value of a square root with positive real part only, the value of is

(a) 1 + i (b) 1 – 3i (c) 1 + 3i (d) none of these

Q 11. , where z is nonreal, can be the angle of a triangle if

(a) Re(z) = 1, Im(z) = 2 (b) Re(z) = 1, -1 ≤ Im(z) ≤ 1 (c) Re(z) + Im(z) = 0 (d) none of these

Q 12. If n is an odd integer, then (1 + i)6n + (1 – i)6n is equal to

(a) 0 (b) 2 (c) -2 (d) none of these

Q 13. If z1= 9y2 – 4 – 10ix, z2 = 8y2 – 20i, where z1 = , then z = x + iy is equal to

(a) -2 + 2i (b) -2 ± 2i (c) -2 ± i (d) none of these

Q 14. The complex numbers sin x – icos 2x and cos x – isin 2x are conjugate to each other for

(a) x = nπ (b) x = 0 (c) x = (2n + 1) (d) no value of x

Q 15. If z = 1 + itan α, where π < α < , then |z| is equal to

(a) sec α (b) – sec α (c) cosec α (d) none of these

Q 16. If z is a complex number satisfying the reaction | z + 1| = z + 2(1 + i) then z is

(a)  (b)  (c)  (d) 

Q 17. If (1 + i)z = (1 + i)then z is

(a) t(1 – i), t ∈ R (b) t(1 + i), t ∈ R (c) , t ∈ R+ (d) none of these

Q 18. If z1, z2 are two nonzero complex numbers such that

|z1 + z2| = |z1| + |z2| then ampis equal to

(a) π (b) -π (c) 0 (d) none of these

Q 19. The complex number z is purely imaginary if

(a) is real (b) z =  (c) z +  = 0 (d) none of these

Q 20. If z = x + iy such that |z + 1| = |z – 1| and amp then

(a)  (b)  (c)  (d) 

Q 21. Let . Then arg z is

(a) 2θ (b) 2θ - π (c) π + 2θ (d) none of these

Q 22. If then the fundamental amplitude of z is

(a)  (b)  (c)  (d) none of these

Q 23. If = r(cos θ + isin θ) then

(a) r = 1, θ = tan-1  (b)  (c)  (d) none of these

Q 24. If z = x + iy satisfies amp (z – 1) = amp (z + 3i) then the value of (x – 1) : y is equal to

(a) 2 : 1 (b) 1 : 3 (c) -1 : 3 (d) none of these

Q 25. Let z be a complex number of constant modulus such that z2 is purely imaginary then the number of possible values of z is

(a) 2 (b) 1 (c) 4 (d) infinite

Q 26. If ω is an imaginary cube root of unity then (1 + ω - ω2)7 equals

(a) 128ω (b) -128ω (c) 128ω2 (d) -128ω2

Q 27. If ω is a nonreal cube root of unity then the expression

(1 - ω)(1 - ω2)(1 + ω4)(1 + ω8) is equal to

(a) 0 (b) 3 (c) 1 (d) 2

Q 28. If 349(x + iy) = and x = ky then k is

(a)  (b)  (c)  (d) 

Q 29. x3m + x3n-1 + x3r-2, where m, n, r, ∈ N, is divisible by

(a) x2 – x + 1 (b) x2 + x + 1 (c) x2 + x – 1 (d) x2 – x – 1

Q 30. If x2 – x + 1 = 0 then the value of is

(a) 8 (b) 10 (c) 12 (d) none of these

Q 31. If 1 + x2 then is equal to

(a) 48 (b) -48 (c) ± 48(ω - ω2) (d) none of these

Q 32. The smallest positive integral value of n for which (1 + )n/2 is real is

(a) 3 (b) 6 (c) 12 (d) 0

Q 33. If , ω = nonreal cube root of unity then

is equal to

(a) 0 if n is even (b) o for all n ∈ 

(c) 2n-1. i for all n ∈ N (d) none of these

Q 34. If z2 – z + 1 = 0 then zn – z-n, where n is a multiple of 3, is

(a) 2(-1)n  (b) 0 (c) (-1)n+1 (d) none of these

Q 35. If ω is a nonreal cube root of unity then

is equal to

(a) -1 (b) 2ω (c) 0 (d) -2ω

Q 36. If (x – 1)4 – 16 = 0 then the sum of nonreal complex values of x is

(a) 2 (b) 0 (c) 4 (d) none of these

Q 37. If zr = , r = 0, 1, 2, 3, 4,….. then z1z2z3z4z5 is equal to

(a) -1 (b) 0 (c) 1 (d) none of these

Q 38. If eiθ = cos θ + isin θ then for the ΔABC, eiA. eiB . eiC is

(a) –i (b) 1 (c) -1 (d) none of these

Q 39. If ()n = ()n, n ∈ N then the least value of n is

(a) 3 (b) 4 (c) 6 (d) none of these

Q 40. If the fourth roots of unity are z1, z2, z3, z4 then is equal to

(a) 1 (b) 0 (c) i (d) none of these

Q 41. If x3- 1 = 0 has the nonreal complex roots α, β then the value of (1 + 2α + β)3 – (3 + 3α + 5β)3 is

(a) -7 (b) 6 (c) -5 (d) 0

Q 42. If then is equal to

(a)  (b)  (c)  (d) 

Q 43. If , n ∈ , the set of integers, then n is a multiple of

(a) 6 (b) 10 (c) 9 (d) 12

Q 44. If z(2 – )2 = i()4 the amplitude of z is

(a)  (b)  (c)  (d) 

Q 45. If z is a nonreal root of then z86 + z175 + z289 is equal to

(a) 0 (b) -1 (c) 3 (d) 1

Q 46. If α is nonreal and α = then the value of is equal to

(a) 4 (b) 2 (c) 1 (d) none of these

Q 47. The value of amp (iω) + amp (iω2), where and = nonreal, is

(a) 0 (b)  (c) π (d) none of these

Q 48. If α, β be two complex numbers then |α2| + |β|2 is equal to

(a)  (b) 

(c)  (d) none of these

Q 49. The set of values of a ∈ R for which x2 + i(a – 1)x + 5 = 0 will have a pair conjugate complex roots is

(a) R (b) {1} (c) {a|a2 – 2a + 21 > 0} (d) none of these

Q 50. Nonreal complex numbers z satisfying the equation z3 + 2z2 + 3z + 2 = 0 are

(a)  (b)  (c)  (d) none of these

Q 51. For a complex number z, the minimum value of |z| + |z -2 | is

(a) 1 (b) 2 (c) 3 (d) none of these

Q 52. If |z| = 1 then is equal to

(a) z (b)  (c)  (d) none of these

Q 53. If α is a nonreal cube root of unity then |αn|, n ∈ , is equal to

(a) 1 (b) 3 (c) 0 (d) none of these

Q 54. If z be a complex number satisfying z4 + z3 + 2z2 + z + 1 = 0 then |z| is

(a)  (b)  (c) 1 (d) none of these

Q 55. Let z1 = a + ib, z2= p + iq be two unimodular complex numbers such that Im() = 1. If ω1 = a + ip, ω2 = b + iq then

(a) Re(ω1ω2) = 1 (b) Im(ω1ω2) = 1 (c) Re(ω1ω2) = 0 (d) Im() = 1

Q 56. If |z1 – 1| < 1, |z2 – 2| < 2, |z3 – 3| < 3 then |z1 + z2 + z3|

(a) is less than 6 (b) is more than 3 (c) is less than 12 (d) lies between 6 and 12

Q 57. If |z – i| ≤ 2 and z0 = 5 + 3i then the maximum value of |iz + z0| is

(a)  (b) 7 (c)  (d) none of these

Q 58. If |z| = max {|z – 1|, |z + 1|} then

(a)  (b)  (c)  (d) none of these

Q 59. |z – 4| < |z – 2| represents the region given by

(a) Re(z) > 0 (b) Re(z) < 0 (c) Re(z) > 2 (d) none of these

Q 60. If < 0 then the region traced by z is

(a) |z| < 3 (b) 1 < |z| < 3 (c) |z| > 1 (d) |z| < 2

Q 61. represents

(a) a circle (b) an ellipse (c) a straight line (d) none of these

Q 62. If 2z1 – 3z2 + z3 = 0 then z1, z2, z3 are represented by

(a) three vertices of a triangle (b) three collinear points

(c) three vertices of a rhombus (d) none of these

Q 63. If A, B, C are three points in the Argand plane representing the complex numbers z1, z2, z3 such that , where λ ∈ R, then the distance of A from the line BC is

(a) λ (b)  (c) 1 (d) 0

Q 64. The roots of the equation 1 + z + z3 + z4 = 0 are represented by the vertices of

(a) a square (b) an equilateral triangle (c) a rhombus (d) none of these

Q 65. If then z is represented by a point lying on

(a) a circle (b) an ellipse (c) a straight line (d) none of these

Q 66. The angle that the vector representing the complex numbermakes with the positive direction of the real axis is

(a)  (b)  (c)  (d) 

Q 67. If P, P' represent the complex number z1 and its additive inverse respectively then the complex equation of the circle with PP' as a diameter is

(a)  (b)  (c)  (d) none of these

Q 68. If |z1| = |z2| = |z3| = |z4| then the points representing z1, z2, z3, z4 are

(a) concyclic (b) vertices of a square

(c) vertices of a rhombus (d) none of these

Q 69. Suppose z1, z2, z3 are the vertices of an equilateral triangle inscribed in the circle |z| = 2. If z1 = 1 + and z1, z2, z3 are in the clockwise sense then

(a) z1 = 1-, z3 = -2 (b) z2 = 2, z3 = 1 -  (c) z2= -1+, z3 = -2 (d) none of these

Q 70. Suppose z1, z2, z3 are the vertices of an equilateral triangle circumscribing the circle |z| = 1. If z1 = 1 + and z1, z2, z3 are in the anticlockwise sense then z2 is

(a)  (b) 2 (c)  (d) none of these

Q 71. If amp then z represents a point on

(a) a straight line (b) a circle (c) a pair of lines (d) none of these

Q 72. If the roots of z3 + iz2 + 2i = 0 represent the vertices of a ΔABC in the Argand plane then the area of the triangle is

(a)  (b)  (c) 2 (d) none of these

Q 73. The equation +(4 – 3i)z + (4 + 3i) + 5 = 0 represents a circle whose radius is

(a) 5 (b)  (c)  (d) none of these

Q 74. If z is a complex number such that = 1 then z lies on

(a) the real axis (b) the line Im(z) = 3 (c) a circle (d) none of these

Q 75. Let z1 and z2 be two nonreal complex cube roots of unity and |z – z1|2 + |z – z2|2 = λ be the equation of a circle with z1, z2 as ends of a diameter then the value of λ is

(a) 4 (b) 3 (c) 2 (d) 

Q 76. Let λ ∈ R. If the origin and the nonreal roots of 2z2 + 2z + λ = 0 form the three vertices of an equilateral triangle in the Argand plane then λ is

(a) 1 (b)  (c) 2 (d) 1

Q 77. The equation |z – i| + |z + i| = k, k > 0, can represent an ellipse if k is

(a) 1 (b) 2 (c) 4 (d) none of these

Q 78. The equation |z + i| - |z – i| = k represents a hyperbola if

(a) -2 < k < 2 (b) k > 2 (c) 0 < k < 2 (d) none of these

Q 79. Let OP.OQ = 1 and let O, P, Q be three collinear points. If O and Q represent the complex numbers 0 and z then P represents

(a)  (b)  (c)  (d) none of these

Q 80. Let , where t is a real parameter. Then locus of z in the Argand plane is

(a) a hyperbola (b) an ellipse (c) a straight line (d) none of these

Q 81. The area of the triangle whose vertices are i, α, β, where and α, β are the nonreal cube roots of unity, is

(a)  (b)  (c) 0 (d) 

**Choose the correct options. One or more options may be correct.**

Q 82. The nonzero real value of x for which is purely real is

(a)  (b) 1 (c)  (d) none of these

Q 83. If and such that z1 = then

(a) a = 1, b = 1 (b) a = -1, b = 1 (c) a = 1, b = -1 (d) none of these

Q 84. If z1, z2, z3, z4 are roots of the equation

a0z4 + a1z3 + a2z2 + a3z + a4 = 0

where a0, a1, a2, a3 and a4 are real, then

(a) are also roots of the equation (b) z1 is equal to at least one of 

(c) are also roots of the equation (d) none of these

Q 85. If α is a complex constant such that has a real root then

(a)  (b)  (c) 

(d) the absolute value of the real roots is 1

Q 86. If amp(z1z2) = 0 and |z1| = |z2| = 1 then

(a) z1 + z2 = 0 (b) z1z2 = 1 (c) z1 =  (d) none of these

Q 87. If z is a nonzero complex number then is equal to

(a)  (b) 1 (c)  (d) none of these

Q 88. If ω is a nonreal cube root of unity then the value of

1.(2 - ω)(2 - ω2) + 2. (3 - ω)(3 - ω2) + …. + (n – 1)(n - ω)(n - ω2) is

(a) real (b)  (c)  (d) not real

Q 89. If z is a complex number satisfying z + z-1 = 1 then zn + z-n, n ∈ N, has the value

(a) 2(-1)n when n is a multiple of 3 (b) (-1)n-1 when n is not a multiple of 3

(c) (-1)n+1 when n is a multiple of 3 (d) 0 when n is not a multiple of 3

Q 90. The value of α-n + α-2n, n ∈ N and α is a nonreal cube root of unity, is

(a) 3 if n is a multiple of 3 (b) -1 if n is not a multiple of 3

(c) 2 if n is a multiple of 3 (d) none of these

Q 91. The value of α4n-1 + α4n-2 + α4n-3, n ∈ N and α is a nonreal fourth root of unity, is

(a) 0 (b) -1 (c) 3 (d) none of these

Q 92. Let x be a nonreal complex number satisfying (x – 1)3 + 8 = 0 then x is

(a) 1 + 2ω (b) 1 - 2ω (c) 1 - 2ω2 (d) none of these

Q 93. If then

(a) Re(z) = 2Im(z) (b) Re(z) + 2Im(z) = 0 (c) |z| =  (d) amp z = tan-12

Q 94. If z is different from ± i and |z| = 1 then is

(a) purely real (b) nonreal, whose real and imaginary parts are equal

(c) purely imaginary (d) none of these

Q 95. If z1, z2 are two compelx numbers then

(a) |z1 + z2| ≤ |z1| + |z1| (b) |z1 – z2| ≥ |z1| - |z2|

(c) |z1 + z2| ≥ |z1 . z2| (d) |z1 – z2| ≤ |z1 + z2|

Q 96. Let z1, z2 be two complex numbers represented by points on the circle |z| = 1 and |z| = 2 respectively then

(a) max |2z1 + z2| = 4 (b) min |z1 – z2| = 1

(c)  (d) none of these

Q 97. ABCD is a square, vertices being taken in the anticlockwise sense. If A represents the complex number z and the intersection of the diagonals is the origin then

(a) B represents the complex number iz (b) D represents the complex number 

(c) B represents the complex number (d) D represents the complex number -****

Q 98. If = 0, where α is a complex constant, then z is represented by a point on

(a) a straight line (b) a circle (c) a parabola (d) none of these

Q 99. If z1, z2, z3, z4 are the four complex numbers represented by the vertices of a quadrilateral taken in order such that z1 – z4 = z2 – z3 and ampthen the quadrilateral is a

(a) rhombus (b) square (c) rectangle (d) a cyclic quadrilateral

Q 100. If z0, z1 represent point P, Q on the locus |z – 1| = 1 and the line segment PQ subtends and angle π/2 at the point z = 1 then z1 is equal to

(a) ** (b)  (c)  (d) **

Q 101. If |z1| = |z2| = |z3| = 1 and z1, z2, z3 are represented by the vertices of an equilateral triangle then

(a) z1 + z2 + z3 = 0 (b) z1z2z3 = 1 (c) z1z2 = z2z3 + z3z1 = 0 (d) none of these

Q 102. Let A, B, C be three collinear points which are such that AB.AC = 1 and the points are represented in the Argand plane by the line complex numbers 0, z1, z2 respectively. Then

(a) z1z2 = 1 (b)  (c) |z1||z2| = 1 (d) none of these

Q 103. If z1, z2, z3, z4 are represented by the vertices of a rhombus taken in the anticlockwise order then

(a) z1- z2 + z3 – z4 = 0 (b) z1+ z2 = z3 + z4 (c)  (d) 

Q 104. If and z0 = 3 + 4i then

(a)  (b) z0z + = 12 (c) += 0 (d) none of these

Q 105. If z1 ≠ z2 and |z1 + z2| = then

(a) at least one of z1.z2 is unimodular (b) both z1, z2 are unimodular

(c) z1.z2 is unimodular (d) none of these

Q 106. Let . Then

(a) |z1| = |z2| (b) amp z1 + amp z2 = 0 (c) 3|z1| = |z2| (d) 3amp z1 + amp z2 = 0

Q 107. If |z1 + z2| = |z1 – z2| then

(a) |amp z1 – amp z2| =  (b) |amp z1 – amp z2| = π

(c) is purely real (d) is purely imaginary

Q 108. If |z1 + z2|2 = |z1|2 + |z2|2 then

(a) is purely real (b) is purely imaginary (c)  (d) 

1b 2b 3d 4c 5b 6a 7a 8c 9b 10d

11b 12a 13b 14d 15b 16c 17a 18c 19c 20b

21a 22b 23a 24b 25c 26d 27b 28d 29b 30a

31b 32b 33a 34b 35b 36a 37c 38c 39c 40b

41a 42c 43d 44b 45b 46a 47c 48b 49b 50a

51b 52a 53a 54c 55d 56c 57b 58c 59d 60a

61c 62b 63d 64b 65c 66d 67a 68a 69a 70d

71b 72c 73b 74a 75b 76b 77c 78a 79c 80a

81d 82ac 83c 84ab 85acd 86bc 87ab 88ab 89ab 90bc

91b 92bc 93ac 94c 95ab 96abc 97ad 98b 99cd 100ac

101ab 102bc 103ac 104b 105c 106ad 107ad 108bcd