COMPLEX NUMBERS AND QUADRATIC EQUATIONS

1. The value of the expression $x^4 - 8x^3 + 18x^2 - 8x + 2$ when $x = 2 + \sqrt{3}$

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

2. If $z = x + iy (x, y \in R, x \neq -1/2)$, the number of value of z safisfying $|z|^n = z^2|z|^{n-2} + z|z|^{n-2} + 1 \cdot (n \in N, \ n > 1)$ is

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

3. If α, β, γ are the roots of $x^3 - x^2 - 1 = 0$ then the value of $(1+\alpha)/(1-\alpha) + (1+\beta)/(1-\beta) + (1+\gamma)/(1-\gamma)$ is equal to

a) -5 b) -6 c) -7 d) -2

4. If the equation $|x^2 + bx + c| = k$ has four roots, then

a) $b^2 - 4c > 0$ and $0 < k < \frac{4c-b^2}{4}$

b) $b^2 - 4c < 0$ and $0 < k < \frac{4c-b^2}{4}$

c) $b^2 - 4c > 0$ and $k > \frac{4c-b^2}{4}$

d) None of these

5. The value of z satisfying the equation $\log z + \log z^2 + \cdots + \log z^n = 0$ is

a) $\cos\frac{4m\pi}{n(n+1)} + i\sin\frac{4m\pi}{n(n+1)}, m = 1, 2, \ldots$

b) $\cos\frac{4m\pi}{n(n+1)} - i\sin\frac{4m\pi}{n(n+1)}, m = 1, 2, \ldots$

c) $\sin\frac{4m\pi}{n(n+1)} + i\cos\frac{4m\pi}{n(n+1)}, m = 1, 2, \ldots$

d) 0

6. If $a(p+q)^2 + 2bpq + c = 0$ and $a(p+r)^2 + 2bpr + c = 0$ $(a \neq 0)$, then

a) $qr = p^2$ b) $qr = p^2 + \frac{c}{a}$ c) $qr = -p^2$ d) None of these

7. The value of m for which one of the roots of $x^2 - 3x + 2m = 0$ is double of one of the roots of $x^2 - x + m = 0$ is

a) -2 b) 1 c) 2 d) None of these

8. Roots of the equations are $(z+1)^5 = (z-1)^5$ are

a) $\pm i\tan\left(\frac{\pi}{5}\right), \pm i\tan\left(\frac{2\pi}{5}\right)$

b) $\pm i\cot\left(\frac{\pi}{5}\right), \pm i\cot\left(\frac{2\pi}{5}\right)$

c) $\pm i\cot\left(\frac{\pi}{5}\right), \pm i\tan\left(\frac{2\pi}{5}\right)$

d) None of these

9. Total number of integral values of 'a' so that $x^2 - (a+1)x + a - 1 = 0$ has integral roots is equal to

a) 1 b) 2 c) 4 d) None of these

10. z_1, z_2, z_3, z_4 are distinct complex numbers representing the vertices of a quadrilateral $ABCD$ taken in order. If $z_1 - z_4 = z_2 - z_3$ and $\arg[(z_4 - z_1)/(z_2 - z_1)] = \pi/2$, then the quadrilateral is

a) Rectangle b) Rhombus c) Square d) Trapezium

11. If the roots of the equation $ax^2 + bx + c = 0$ are of the form $(k+1)/k$ and $(k+2)/(k+1)$, then $(a+b+c)^2$ is equal to

a) $2b^2 - ac$ b) $\sum a^2$ c) $b^2 - 4ac$ d) $b^2 - 2ac$

12. Let r, s and t be the roots of the equation, $8x^3 + 1001x + 2008 = 0$. The value of $(r+s)^3 + (s+t)^3 + (t+r)^3$ is

a) 251 b) 751 c) 735 d) 753

13. If $b > a$, then the equation $(x-a)(x-b) - 1 = 0$ has

a) Both roots in (a, b) b) Both roots in $(-\infty, a)$

c) Both roots in $(b, +\infty)$ d) One root in $(-\infty, a)$ and the other in $(b, +\infty)$

14. If l, m, n are real $l \neq m$, then the roots of the equation $(l-m)x^2 - 5(l+m)x - 2(l-, m) = 0$ are

a) Real and equal b) Complex c) Real and unequal d) None of these

15. If the expression $x^2 + 2(a+b+c)x + 3(bc+ca+ab)$ is a perfect square, then

a) $a = b = c$ b) $a = \pm b = \pm c$ c) $a = b \neq c$ d) None of these

16. If $|z| < \sqrt{2} - 1$, then $|z^2 + 2z\cos\alpha|$ is

a) Less than 1 b) $\sqrt{2} + 1$ c) $\sqrt{2} - 1$ d) None of these

17. If ω be a complex n^{th} root of unity, then $\sum_{i=1}^{n}(ar+b)\,\omega^{r-1}$ is equal to

a) $\frac{n(n+1)a}{2}$ b) $\frac{nb}{1-n}$ c) $\frac{na}{\omega - 1}$ d) None of these

18. If $a, b \in R, a \neq 0$ and the quadratic equation $ax^2 - bx + 1 = 0$ has imaginary roots then $(a+b+1)$ is

a) Positive b) Negative

c) Zero d) Dependent on the sign of b

19. Sum of the non-real roots of $(x^2 + x - 2)(x^2 + x - 3) = 12$ is

a) -1 b) 1 c) -6 d) 6

20. Let $z = \cos\theta + i\sin\theta$. Then, the value of $\sum_{m=1}^{15} \text{Im}(z^{2m-1})$ at $\theta = 2°$ is

a) $\frac{1}{\sin 2°}$ b) $\frac{1}{3\sin 2°}$ c) $\frac{1}{2\sin 2°}$ d) $\frac{1}{4\sin 2°}$

21. If α, β be the roots of the equation $u^2 - 2u + 2 = 0$ and if $\cot\theta = x + 1$, then $[(x+\alpha)^n -$

$(x+\beta)^n]/[\alpha-\beta]$ is equal to

a) $\frac{\sin n\theta}{\sin^n \theta}$ b) $\frac{\cos n\theta}{\cos^n \theta}$ c) $\frac{\sin n\theta}{\cos^n \theta}$ d) $\frac{\cos n\theta}{\sin^n \theta}$

22. If the cube roots of unity are $1, \omega, \omega^2$, then the roots of the equation $(x-1)^3+8=0$ are

a) $-1, 1+2\omega, 1+2\omega^2$ b) $-1, 1-2\omega, 1-2\omega^2$ c) $-1, -1, -1$ d) None of these

23. Suppose A is a complex number and $n \in N$, such that $A^n=(A+1)^n=1$, then the least value of n is

a) 3 b) 6 c) 9 d) 12

24. If a, b, c, d are four consecutive terms of an increasing A.P. then the roots of the equation$(x-a)(x-c)+2(x-b)(x-d)=0$ are

a) Non-real complex b) Real and equal c) Integers d) Real and distinct

25. If the equations $ax^2+bx+c=0$ and $x^3+3x^2+3x+2=0$ have two common roots, then

a) $a=b=c$ b) $a=b\neq c$ c) $a=-b=c$ d) None of these

26. If α and β, α and γ, α and δ are the roots of the equations $ax^2+2bx+c=0, 2bx^2+cx+a=0$ and $cx^2+ax+2b=0$, respectively, where a, b and c are positive real numbers, then $\alpha+\alpha^2=$

a) abc b) $a+2b+c$ c) -1 d) 0

27. If α, β are the roots of $x^2+px+q=0$ and $x^{2n}+p^nx^n+q^n=0$ and if $(\alpha/\beta), (\beta/\alpha)$ are the roots of $x^n+1+(x+1)^n=0$, then $n(\in N)$

a) Must be an odd integer b) May be any integer

c) Must be an even integer d) Cannot say anything

28. If $z^2+z|z|+|z^2|=0$, then the locus of z is

a) A circle b) A straight line

c) A pair of straight lines d) None of these

29. If $|z|=1$ and $w=\frac{z-1}{z+1}$ (where $z\neq-1$), then $\text{Re}(w)$ is

a) 0 b) $\frac{1}{|z+1|^2}$ c) $\left|\frac{1}{z+1}\right|.\frac{1}{|z+1|^2}$ d) $\frac{\sqrt{2}}{|z+1|^2}$

30. If the equation$x^2+ax+b=0$ has distinct real roots and $x^2+a|x|+b=0$ has only one real root, then which of the following is true

a) $b=0, a>0$ b) $b=0, a<0$ c) $b>0, a<0$ d) $b<0, a>0$

31. Let $f(x)=ax^2-bx+c^2, b\neq0$ and $f(x)\neq0$ for all $x\in R$. Then

a) $a+c^2<b$ b) $4a+c^2>2b$ c) $9a-3b+c^2<0$ d) None of these

32. The number of real roots of the equation$x^2-3|x|+2=0$ is

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

33. If z_1 and z_2 are the complex roots of the equation $(x-3)^3+1=0$, then z_1+z_2 equals to

a) 1 b) 3 c) 5 d) 7

34. If $x^2 + px + 1$ is factor of the expression $ax^3 + bx + c$, then

a) $a^2 - c^2 = ab$ b) $a^2 + c^2 = -ab$ c) $a^2 - c^2 = -ab$ d) None of these

35. If $z = (i)^{(i)^{(i)}}$ where $i = \sqrt{-1}$, then $|z|$ is equal to

a) 1 b) $e^{-\pi/2}$ c) $e^{-\pi}$ d) None of these

36. The number of roots of the equation $\sqrt{x-2}(x^2 - 4x + 3) = 0$ is

a) Three b) Four c) One d) Two

37. Total number of values of a so that $x^2 - x - a = 0$ has integral roots, where $a \in N$ and $6 \le a \le 100$, is equal to

a) 2 b) 4 c) 6 d) 8

38. If a, b, c are the sides of the triangle ABC such that $a \ne b \ne c$ and $x^2 - 2(a + b + c)x + 3\lambda(ab + bc + ca) = 0$ has real roots, then

a) $\lambda < \frac{4}{3}$ b) $\lambda > \frac{5}{3}$ c) $\lambda \in \left(\frac{4}{3}, \frac{5}{3}\right)$ d) $\lambda \in \left(\frac{1}{3}, \frac{5}{3}\right)$

39. Suppose A, B, C are defined as $A = a^2b + ab^2 - a^2c - ac^2, B = b^2c + bc^2 - a^2b - ab^2$ and $C = a^2c + ac^2 - b^2c - bc^2$, where $a > b > c > 0$ and the equation $Ax^2 + Bx + C = 0$ has equal roots, then a, b, c are in

a) A.P. b) G.P. c) H.P. d) A.G.P.

40. Consider the equation $x^2 + 2x - n = 0$, where $n \in N$ and $n \in [15, 100]$. Total number of different values of 'n' so that the given equation has integral roots is

a) 8 b) 3 c) 6 d) 4

41. If $x^2 + x + 1 = 0$, then the value of $(x + 1/x)^2 + (x^2 + 1/x^2)^2 + \cdots + (x^{27} + 1/x^{27})^2$ is

a) 27 b) 72 c) 45 d) 54

42. If $(x^2 + px + 1)$ is a factor of $(ax^3 + bx + c)$, then

a) $a^2 + c^2 = -ab$ b) $a^2 - c^2 = -ab$ c) $a^2 - c^2 = ab$ d) None of these

43. Let z, w be complex numbers such that $\bar{z} + i\bar{w} = 0$ and $\arg zw = \pi$. Then $\arg z$ equals

a) $\frac{\pi}{4}$ b) $\frac{\pi}{2}$ c) $\frac{3\pi}{4}$ d) $\frac{5\pi}{4}$

44. If $a > 0, b > 0$ and $c > 0$ then the roots of the equation $ax^2 + bx + c = 0$

a) Are real and negative b) Have positive real parts

c) Have negative real parts d) None of these

45. Which of the following is equal to $\sqrt[3]{-1}$?

a) $\frac{\sqrt{3} + \sqrt{-1}}{2}$ b) $\frac{-\sqrt{3} + \sqrt{-1}}{\sqrt{-4}}$ c) $\frac{\sqrt{3} - \sqrt{-1}}{\sqrt{-4}}$ d) $-\sqrt{-1}$

46. The interval of a for which the equation $\tan^2 x - (a - 4)\tan x + 4 - 2a = 0$ has at least one

solution $\forall x \in [0, \pi/4]$

a) $a \in (2,3)$ b) $a \in [2,3]$ c) $a \in (1,4)$ d) $a \in [1,4]$

47. Which of the following represents a point in an Argand plane, equidistant from the roots of the equation $(z+1)^4 = 16z^4$?

a) $(0,0)$ b) $\left(-\frac{1}{3}, 0\right)$ c) $\left(\frac{1}{3}, 0\right)$ d) $\left(0, \frac{2}{\sqrt{5}}\right)$

48. If α, β, γ are such that $\alpha + \beta + \gamma = 2, \alpha^2 + \beta^2 + \gamma^2 = 6, \alpha^3 + \beta^3 + \gamma^3 = 8$, then $\alpha^4 + \beta^4 + \gamma^4$ is

a) 18 b) 10 c) 15 d) 36

49. The minimum value of $|a + b\omega + c\omega^2|$, where a, b and c are all not equal integers and $\omega(\neq 1)$ is a cube root of unity, is

a) $\sqrt{3}$ b) $1/2$ c) 1 d) 0

50. If $|z_1| = |z_2| = |z_3| = 1$ and $z_1 + z_2 + z_3 = 0$, then area of the triangle whose vertices are z_1, z_2, z_3 is

a) $3\sqrt{3}/4$ b) $\sqrt{3}/4$ c) 1 d) 2

51. Number of positive integers n for which $n^2 + 96$ is a perfect square is

a) 8 b) 12 c) 4 d) Infinite

52. The greatest positive argument of complex number satisfying $|z - 4| = \text{Re}(z)$ is

a) $\frac{\pi}{3}$ b) $\frac{2\pi}{3}$ c) $\frac{\pi}{2}$ d) $\frac{\pi}{4}$

53. If x and y are complex numbers, then the system of equations $(1+i)x + (1-i)y = 1, 2ix + 2y = 1 + i$ has

a) Unique solution b) No solution

c) Infinite number of solutions d) None of these

54. For the equation$3x^2 + px + 3 = 0, p > 0$, if one of the root is square of the other, then p is equal to

a) $1/3$ b) 1 c) 3 d) $2/3$

55. If α, β are the roots of the equation$x^2 - 2x + 3 = 0$. Then the equation whose roots are $P = \alpha^3 - 3\alpha^2 + 5\alpha - 2$ and $Q = \beta^3 - \beta^2 + \beta + 5$ is

a) $x^2 + 3x + 2 = 0$ b) $x^2 - 3x - 2 = 0$ c) $x^2 - 3x + 2 = 0$ d) None of these

56. If centre of a regular hexagon is at origin and one of the vertices on Argand diagram is $1 + 2i$, then its perimeter is

a) $2\sqrt{5}$ b) $6\sqrt{2}$ c) $4\sqrt{5}$ d) $6\sqrt{5}$

57. If $z_1 z_2 \in C, z_1^2 + z_2^2 \in R, z_1(z_1^2 - 3z_2^2) = 2$ and $z_2(3z_1^2 - z_2^2) = 11$, then the value of $z_1^2 + z_2^2$ is

a) 10 b) 12 c) 5 d) 8

58. $P(x)$ is a polynomial with integral coefficients such that for four distinct integers $a, b, c, d; P(a) = P(b) = P(c) = P(d) = 3$. If $P(e) = 5$ (e is an integer), then

a) $e = 1$ b) $e = 3$ c) $e = 4$ d) No real value of e

59. If α, β are the roots of $ax^2 + bx + c = 0$ and $\alpha + b, \beta + h$ are the roots of $px^2 + qx + r = 0$, then $h =$

a) $-\frac{1}{2}\left(\frac{a}{b} - \frac{p}{q}\right)$ b) $\left(\frac{b}{a} - \frac{q}{p}\right)$ c) $\frac{1}{2}\left(\frac{b}{a} - \frac{q}{p}\right)$ d) None of these

60. If t and c are two complex numbers such that $|t| \neq |c|, |t| = 1$ and $z = (at + b)/(t - c), z = x + iy$. Locus of z is (where a, b are complex numbers)

a) Line segment b) Straight line c) Circle d) None of these

61. The complex numbers $z = x + iy$ which satisfy the equation $|(z - 5i)/(z + 5i)| = 1$ lie on

a) The x-axis b) The straight line $y = 5$

c) A circle passing through the origin d) None of these

62. If α and β $(\alpha < \beta)$ are the roots of the equation $x^2 + bx + c = 0$, where $c < 0 < b$, then

a) $0 < \alpha < \beta$ b) $\alpha < 0 < \beta < |\alpha|$ c) $\alpha < \beta < 0$ d) $\alpha < 0 < |\alpha| < \beta$

63. All the values of m for which both the roots of the equation $x^2 - 2mx + m^2 - 1 = 0$ are greater than -2 but less than 4, lie in the interval

a) $-2 < m < 0$ b) $m > 3$ c) $-1 < m < 3$ d) $1 < m < 4$

64. Two towns A and B are 60 km apart. A school is to be built to serve 150 students in town A and 50 students in town B. If the total distance to be travelled by all 200 students is to be as small as possible, then the school be built at

a) Town B b) 45 km from town A c) Town A d) 45 km from town B

65. If $z = \left[\left(\sqrt{3}/2\right) + i/2\right]^5 + \left[\left(\sqrt{3}/2\right) - i/2\right]^5$, then

a) $\text{Re}(z) = 0$ b) $\text{Im}(z) = 0$ c) $\text{Re}(z) > 0, \text{Im}(z) > 0$ d) $\text{Re}(z) > 0, \text{Im}(z) < 0$

66. Let p and q be real numbers such that $p \neq 0, p^3 \neq q$ and $p^3 \neq -q$. If α and β are non-zero complex numbers satisfying $\alpha + \beta = -p$ and $\alpha^3 + \beta^3 = q$, then a quadratic equation having $\frac{\alpha}{\beta}$ and $\frac{\beta}{\alpha}$ as its roots is

a) $(p^3 + q)x^2 - (p^3 + 2q)x + (p^3 + q) = 0$ b) $(p^3 + q)x^2 - (p^3 - 2q)x + (p^3 + q) = 0$

c) $(p^3 - q)x^2 - (5p^3 - 2q)x + (p^3 - q) = 0$ d) $(p^3 - q)x^2 - (5p^3 + 2q)x + (p^3 - q) = 0$

67. Let p and q be roots of the equation $x^2 - 2x + A = 0$ and let r and s be the roots of the equation $x^2 - 18x + B = 0$. If $p < q < r < s$ are in arithmetic progression, then the values of A and B are

a) $3, -77$ b) $3, 77$ c) $-3, -77$ d) $-3, 77$

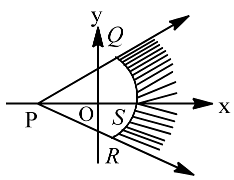
68. If α and β are the roots of the equation $x^2 + px + q = 0$, and α^4 and β^4 are the roots of $x^2 - rx + q = 0$, then the roots of $x^2 - 4qx + 2q^2 - r = 0$ are always

a) Both non-real b) Both positive c) Both negative d) Opposite in sign

69. The shaded region, where

$$P \equiv (-1, 0), Q \equiv (-1 + \sqrt{2}, \sqrt{2})$$

$R \equiv \left(-1 + \sqrt{2}, -\sqrt{2}\right), S \equiv (1, 0)$ is represented by



a) $|z + 1| > 2, |\arg(z + 1) < \frac{\pi}{4}|$ b) $|z + 1| < 2, \arg(z + 1) < \frac{\pi}{2}$

c) $|z - 1| > 2, \arg(z + 1) > \frac{\pi}{4}$ d) $|z - 1| < 2, |\arg(z + 1) > \frac{\pi}{4}$

70. Number of values of a for which equations $x^3 + ax + 1 = 0$ and $x^4 + ax^2 + 1 = 0$ have a common root

a) 0 b) 1 c) 2 d) Infinite

71. If $|z - 2 - i| = |z| \left|\sin\left(\frac{\pi}{4} - \arg z\right)\right|$, then locus of z is

a) A pair of straight lines b) Circle

c) Parabola d) Ellipse

72. If $z = i \log\left(2 - \sqrt{-3}\right)$, then $\cos z =$

a) -1 b) $-1/2$ c) 1 d) $1/2$

73. If $x, y \in R$ satisfy the Equation $x^2 + y^2 - 4x - 2y + 5 = 0$, then the value of the expression $\left[\left(\sqrt{x} - \sqrt{y}\right)^2 + 4\sqrt{xy}\right] / (x + \sqrt{xy})$ is

a) $\sqrt{2} + 1$ b) $\frac{\sqrt{2} + 1}{2}$ c) $\frac{\sqrt{2} - 1}{2}$ d) $\frac{\sqrt{2} + 1}{\sqrt{2}}$

74. The least value of the expression $x^2 + 4y^2 + 3z^2 - 2x - 12y - 6z + 14$ is

a) 1 b) No least value c) 0 d) None of these

75. If $A(z_1), B(z_2), C(z_3)$ are the vertices of the triangle ABC such that $(z_1 - z_2)/(z_3 - z_2) = (1/\sqrt{2}) + (i/\sqrt{2})$, the triangle ABC is

a) Equilateral b) Right angled c) Isosceles d) Obtuse angled

76. If the roots of the equation, $x^2 + 2ax + b = 0$, are real and distinct and they differ by at most $2m$, then b lies in the interval

a) (a^2, a^2+m^2) b) (a^2-m^2, a^2) c) $[a^2-m^2, a^2)$ d) None of these

77. If x is real, then the maximum value of $(3x^2+9x+17)/(3x^2+9x+7)$ is

a) ¼ b) 41 c) 1 d) 17/7

78. If $a<0, b>0$ then $\sqrt{a}\sqrt{b}$ is equal to

a) $-\sqrt{|a|\,b}$ b) $\sqrt{|a|\,b}i$ c) $\sqrt{|a|\,b}$ d) None of these

79. The inequality $|z-4|<|z-2|$ represents the region given by

a) $\text{Re}(z)\geq 0$ b) $\text{Re}(z)<0$ c) $\text{Re}(z)>0$ d) None of these

80. If $x=9^{1/3}9^{1/9}9^{1/27}\ldots\infty$, $y=4^{1/3}4^{-1/9}4^{1/27}\ldots\infty$, and $z=\sum_{r=1}^{\infty}(1+i)^{-r}$,then $\arg(x+yz)$ is equal to

a) 0 b) $\pi-\tan^{-1}\left(\frac{\sqrt{2}}{3}\right)$ c) $-\tan^{-1}\left(\frac{\sqrt{2}}{3}\right)$ d) $-\tan^{-1}\left(\frac{2}{\sqrt{3}}\right)$

81. The set of values of a for which $(a-1)x^2-(a+1)x+a-1\geq 0$ is true for all $x\geq 2$

a) $(-\infty, 1)$ b) $\left(1, \frac{7}{3}\right)$ c) $\left(\frac{7}{3}, \infty\right)$ d) None of these

82. If $w=\alpha+i\beta$, where $\beta\neq 0$ and $z\neq 1$, satisfies the condition that $\left(\frac{w-\bar{w}z}{1-z}\right)$ is purely real, then the set of values of z is

a) $|z|=1, z\neq 2$ b) $|z|=1$ and $z\neq 1$ c) $z=\bar{z}$ d) None of these

83. The number of points of intersection of two curves $y=2\sin x$ and $y=5x^2+2x+3$ is

a) 0 b) 1 c) 2 d) ∞

84. If roots of an equation$x^n-1=0$ are $1, a_1, a_2, \ldots a_{n-1}$, then the value of $(1-a_1)(1-a_2)(1-a_3)\ldots(1-a_{n-1})$ will be

a) n b) n^2 c) n^n d) 0

85. If one root of the equation$ax^2+bx+c=0$ is square of the other, then $a(c-b)^3=cX$, where X is

a) a^3-b^3 b) a^3+b^3 c) $(a-b)^3$ d) None of these

86. Let x, y, z, tbe real numbers $x^2+y^2=9, z^2+t^2=4$ and $xt-yz=6$. Then the greatest value of $P=xz$ is

a) 2 b) 3 c) 4 d) 6

87. Let $\lambda\in R$, the origin and the non-real roots of $2z^2+2z+\lambda=0$ form the three vertices of an equilateral triangle in the Argand plane then λ is

a) 1 b) $\frac{2}{3}$ c) 2 d) -1

88. The number of values of k for which $[x^2-(k-2)x+k^2]\times[x^2+kx+(2k-1)]$ is a perfect square is

a) 2 b) 1 c) 0 d) None of these

89. Let $p(x) = 0$ be a polynomial equation of the least possible degree, with rational coefficients, having $\sqrt[3]{7} + \sqrt[3]{49}$ as one of its roots. Then the product of all the roots of $p(x) = 0$ is

a) 56 b) 63 c) 7 d) 49

90. The number of real solutions of the equation $|x|^2 - 3|x| + 2 = 0$ is

a) 4 b) 1 c) 2 d) 0

91. The number of integral values of a for which the quadratic equation $(x + a)(x + 1991) + 1 = 0$ has integral roots are

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

92. Let z and ω be two complex numbers such that $|z| \leq 1, |\omega| \leq 1$ and $|z - i\omega| = |z - i\overline{\omega}| = 2$ then z equals

a) 1 or i b) i or $-i$ c) 1 or -1 d) i or -1

93. z_1 and z_2 lie on a circle with centre at the origin. The point of intersection z_3 of the tangents at z_1 and z_2 is given by

a) $\frac{1}{2}(\overline{z}_1 + \overline{z}_2)$ b) $\frac{2z_1z_2}{z_1 + z_2}$ c) $\frac{1}{2}\left(\frac{1}{z_1} + \frac{1}{z_2}\right)$ d) $\frac{z_1 + z_2}{\overline{z}_1\overline{z}_2}$

94. If α and β be the roots of the equation $x^2 + px - 1/(2p^2) = 0$ where $p \in R$. Then the minimum value of $\alpha^4 + \beta^4$ is

a) $2\sqrt{2}$ b) $2 - \sqrt{2}$ c) 2 d) $2 + \sqrt{2}$

95. If α, β are the roots of $ax^2 + c = bx$, then the equation $(a + cy)^2 = b^2y$ in y has the roots

a) $\alpha\beta^{-1}, \alpha^{-1}\beta$ b) α^{-2}, β^{-2} c) α^{-1}, β^{-1} d) α^2, β^2

96. If $(\cos\theta + i\sin\theta)(\cos 2\theta + i\sin 2\theta) \cdots (\cos n\theta + i\sin n\theta) = 1$, then the value of θ is, $m \in N$

a) $4m\pi$ b) $\frac{2m\pi}{n(n+1)}$ c) $\frac{4m\pi}{n(n+1)}$ d) $\frac{m\pi}{n(n+1)}$

97. The roots of the cubic equation $(z + ab)^3 = a^3$, such that $a \neq 0$, represent the vertices of a triangle of sides of length

a) $\frac{1}{\sqrt{3}}|ab|$ b) $\sqrt{3}|a|$ c) $\sqrt{3}|b|$ d) $|a|$

98. A quadratic equation whose product of roots x_1 and x_2 is equal to 4 and satisfying the relation $x_1/(x_1 - 1) + x_2/(x_2 - 1) = 2$ is

a) $x^2 - 2x + 4 = 0$ b) $x^2 + 2x + 4 = 0$ c) $x^2 + 4x + 4 = 0$ d) $x^2 - 4x + 4 = 0$

99. If the equation $\cot^4 x - 2\operatorname{cosec}^2 x + a^2 = 0$ has at least one solution then, sum of all possible integral values of a is equal to

a) 4 b) 3 c) 2 d) 0

100 The number of irrational roots of the equation $4x/(x^2 + x + 3) + 5x/(x^2 - 5x + 3) = -3/2$

. is

a) 4 b) 0 c) 1 d) 2