COMPLEX NUMBERS

Integral power of iota, Algebraic operations and Equality of complex numbers

1. If $i = \sqrt{-1}$, then $1 + i^2 + i^3 - i^6 + i^8$ is equal to

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

2. If $i^2 = -1$, then the value of $\sum_{n=1}^{200} i^n$

(A) 50 (B) – 50
(C) 0 (D) 100

3. The value of the sum $\sum_{n=1}^{13} (i^n + i^{n+1})$, where $i = \sqrt{-1}$, equals

(A) i (B) $i - 1$
(C) $-i$ (D) 0

4. The least positive integer n which will reduce $\left(\frac{i-1}{i+1}\right)^n$ to a real number, is

(A) 2 (B) 3
(C) 4 (D) 5

5. The value of $i^{1+3+5+...+(2n+1)}$ is

(A) *i* if *n* is even, – *i* if *n* is odd
(B) 1 if *n* is even, – 1 if *n* is odd
(C) 1 if *n* is odd, – 1 if *n* is even
(D) *i* if *n* is even, – 1 if *n* is odd

6. $\left(\frac{1}{1-2i} + \frac{3}{1+i}\right)\left(\frac{3+4i}{2-4i}\right) =$

(A) $\frac{1}{2} + \frac{9}{2}i$ (B) $\frac{1}{2} - \frac{9}{2}i$
(C) $\frac{1}{4} - \frac{9}{4}i$ (D) $\frac{1}{4} + \frac{9}{4}i$

7. Additive inverse of $1 - i$ is

(A) $0 + 0i$ (B) $-1 - i$
(C) $-1 + i$ (D) None of these

8. $\text{Re}\frac{(1+i)^2}{3-i} =$

(A) $-1/5$ (B) 1/5
(C) 1/10 (D) –1/10

9. If $(1-i)x + (1+i)y = 1 - 3i$, then $(x, y) =$

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

10. $\frac{3 + 2i\sin\theta}{1 - 2i\sin\theta}$ will be real, if $\theta =$

(A) $2n\pi$ (B) $n\pi + \frac{\pi}{2}$
(C) $n\pi$ (D) None of these

[Where n is an integer]

11. If $z \neq 0$ is a complex number, then

(A) $\text{Re}(z) = 0 \Rightarrow \text{Im}(z^2) = 0$
(B) $\text{Re}(z^2) = 0 \Rightarrow \text{Im}(z^2) = 0$
(C) $\text{Re}(z) = 0 \Rightarrow \text{Re}(z^2) = 0$
(D) None of these

12. If $\frac{5(-8+6i)}{(1+i)^2} = a + ib$, then (a, b) equals

(A) (15, 20) (B) (20, 15)
(C) $(-15, 20)$ (D) None of these

13. The true statement is

(A) $1 - i < 1 + i$ (B) $2i + 1 > -2i + 1$
(C) $2i > 1$ (D) None of these

14. $\frac{1-2i}{2+i} + \frac{4-i}{3+2i} =$

(A) $\frac{24}{13} + \frac{10}{13}i$ (B) $\frac{24}{13} - \frac{10}{13}i$
(C) $\frac{10}{13} + \frac{24}{13}i$ (D) $\frac{10}{13} - \frac{24}{13}i$

15. $a + ib > c + id$ can be explained only when

(A) $b = 0, c = 0$ (B) $b = 0, d = 0$
(C) $a = 0, c = 0$ (D) $a = 0, d = 0$

16. If $x, y \in R$ and $(x+iy)(3+2i) = 1+i$, then (x, y) is

(A) $\left(1, \frac{1}{5}\right)$ (B) $\left(\frac{1}{13}, \frac{1}{13}\right)$

(C) $\left(\frac{5}{13}, \frac{1}{13}\right)$ (D) $\left(\frac{1}{5}, \frac{1}{5}\right)$

17. If $\left(\frac{1-i}{1+i}\right)^{100} = a+ib$, then

(A) $a=2, b=-1$ (B) $a=1, b=0$

(C) $a=0, b=1$ (D) $a=-1, b=2$

18. If $z_1 = (4,5)$ and $z_2 = (-3,2)$ then $\frac{z_1}{z_2}$ equals

(A) $\left(\frac{-23}{12}, \frac{-2}{13}\right)$ (B) $\left(\frac{2}{13}, \frac{-23}{13}\right)$

(C) $\left(\frac{-2}{13}, \frac{-23}{13}\right)$ (D) $\left(\frac{-2}{13}, \frac{23}{13}\right)$

19. If $z = 1+i$, then the multiplicative inverse of z^2 is (where $i = \sqrt{-1}$)

(A) $2i$ (B) $1-i$

(C) $-i/2$ (D) $i/2$

20. If $\begin{vmatrix} 6i & -3i & 1 \\ 4 & 3i & -1 \\ 20 & 3 & i \end{vmatrix} = x+iy$, then (x, y) is

(A) (3, 1) (B) (1, 3)

(C) (0, 3) (D) (0, 0)

Conjugate, Modulus and Argument of complex numbers

21. If $\frac{z-i}{z+i} (z \neq -i)$ is a purely imaginary number, then $z.\bar{z}$ is equal to

(A) 0 (B) 1

(C) 2 (D) None of these

22. If $\frac{c+i}{c-i} = a+ib$, where a, b, c are real, then $a^2+b^2 =$

(A) 1 (B) -1

(C) c^2 (D) $-c^2$

23. If the conjugate of $(x+iy)(1-2i)$ be $1+i$, then

(A) $x = \frac{1}{5}$ (B) $y = \frac{3}{5}$

(C) $x+iy = \frac{1-i}{1-2i}$ (D) $x-iy = \frac{1-i}{1+2i}$

24. The conjugate of $\frac{(2+i)^2}{3+i}$, in the form of $a + ib$, is

(A) $\frac{13}{2} + i\left(\frac{15}{2}\right)$ (B) $\frac{13}{10} + i\left(\frac{-15}{2}\right)$

(C) $\frac{13}{10} + i\left(\frac{-9}{10}\right)$ (D) $\frac{13}{10} + i\left(\frac{9}{10}\right)$

25. If $z = 3+5i$, then $z^3 + \bar{z} + 198 =$

(A) $-3-5i$ (B) $-3+5i$

(C) $3+5i$ (D) $3-5i$

26. If z_1 and z_2 be complex numbers such that $z_1 \neq z_2$ and $|z_1| = |z_2|$. If z_1 has positive real part and z_2 has negative imaginary part, then $\frac{(z_1+z_2)}{(z_1-z_2)}$ may be

(A) Purely imaginary

(B) Real and positive

(C) Real and negative

(D) None of these

27. The moduli of two complex numbers are less than unity, then the modulus of the sum of these complex numbers

(A) Less than unity

(B) Greater than unity

(C) Equal to unity

(D) Any

28. The product of two complex numbers each of unit modulus is also a complex number, of

(A) Unit modulus

(B) Less than unit modulus

(C) Greater than unit modulus

(D) None of these

29. Let z be a complex number, then the equation $z^4 + z + 2 = 0$ cannot have a root, such that

(A) $|z| < 1$ (B) $|z| = 1$

(C) $|z| > 1$ (D) None of these

30. If $|z_1| = |z_2| = ... = |z_n| = 1$, then the value of $|z_1 + z_2 + z_3 + ... + z_n| =$

(A) 1

(B) $|z_1| + |z_2| + ... + |z_n|$

(C) $\left|\frac{1}{z_1} + \frac{1}{z_2} + ... + \frac{1}{z_n}\right|$

(D) None of these

31. If $|z| = 1, (z \neq -1)$ and $z = x + iy$, then $\left(\frac{z-1}{z+1}\right)$ is

(A) Purely real (B) Purely imaginary

(C) Zero (D) Undefined

32. The minimum value of $|2z - 1| + |3z - 2|$ is

(A) 0 (B) $1/2$

(C) $1/3$ (D) $2/3$

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

(A) 0 (B) $-\frac{1}{|z+1|^2}$

(C) $\left|\frac{z}{z+1}\right| \cdot \frac{1}{|z+1|^2}$ (D) $\frac{\sqrt{2}}{|z+1|^2}$

34. A real value of x will satisfy the equation $\left(\frac{3-4ix}{3+4ix}\right) = \alpha - i\beta\,(\alpha, \beta \text{ real})$, if

(A) $\alpha^2 - \beta^2 = -1$ (B) $\alpha^2 - \beta^2 = 1$

(C) $\alpha^2 + \beta^2 = 1$ (D) $\alpha^2 - \beta^2 = 2$

35. Let z_1 be a complex number with $|z_1| = 1$ and z_2 be any complex number, then $\left|\frac{z_1 - z_2}{1 - z_1 \bar{z}_2}\right| =$

(A) 0 (B) 1

(C) -1 (D) 2

36. $\arg\left(\frac{3+i}{2-i} + \frac{3-i}{2+i}\right)$ is equal to

(A) $\frac{\pi}{2}$ (B) $-\frac{\pi}{2}$

(C) 0 (D) $\frac{\pi}{4}$

37. If $z_1 . z_2 .... z_n = z$, then $\arg z_1 + \arg z_2 + ... + \arg z_n$ and $\arg z$ differ by a

(A) Multiple of π (B) Multiple of $\frac{\pi}{2}$

(C) Greater than π (D) Less than π

38. Let z be a purely imaginary number such that $\text{Im}(z) > 0$. Then $\arg(z)$ is equal to

(A) π (B) $\frac{\pi}{2}$

(C) 0 (D) $-\frac{\pi}{2}$

39. Let z be a purely imaginary number such that $\text{Im}(z) < 0$. Then $\arg(z)$ is equal to

(A) π (B) $\frac{\pi}{2}$

(C) 0 (D) $-\frac{\pi}{2}$

40. If z is a purely real number such that $\text{Re}(z) < 0$, then $\arg(z)$ is equal to

(A) π (B) $\frac{\pi}{2}$

(C) 0 (D) $-\frac{\pi}{2}$

41. If $\arg z < 0$ then $\arg(-z) - \arg(z)$ is equal to

(A) π (B) $-\pi$

(C) $-\frac{\pi}{2}$ (D) $\frac{\pi}{2}$

42. The amplitude of $\frac{1+\sqrt{3}\,i}{\sqrt{3}-i}$ is

(A) 0 (B) $\pi/6$

(C) $\pi/3$ (D) $\pi/2$

43. If $z = \frac{-2}{1+\sqrt{3}\,i}$ then the value of $\arg(z)$ is **[**

(A) π (B) $\pi/3$

(C) $2\pi/3$ (D) $\pi/4$

44. If $z = \cos\frac{\pi}{6} + i\sin\frac{\pi}{6}$ then

(A) $|z| = 1, \ \arg z = \frac{\pi}{4}$

(B) $|z| = 1, \arg z = \frac{\pi}{6}$

(C) $|z| = \frac{\sqrt{3}}{2}, \arg z = \frac{5\pi}{24}$

(D) $|z| = \frac{\sqrt{3}}{2}, \ \arg z = \tan^{-1}\frac{1}{\sqrt{2}}$

45. The amplitude of $\sin\frac{\pi}{5} + i\left(1-\cos\frac{\pi}{5}\right)$

(A) $\pi/5$ (B) $2\pi/5$

(C) $\pi/10$ (D) $\pi/15$

Square root, Representation and Logarithm of complex numbers

46. If $\sqrt{a+ib} = x+iy$, then possible value of $\sqrt{a-ib}$ is

(A) x^2+y^2 (B) $\sqrt{x^2+y^2}$

(C) $x+iy$ (D) $x-iy$

47. The number of non-zero integral solutions of the equation $|1-i|^x = 2^x$ is

(A) Infinite (B) 1

(C) 2 (D) None of these

48. $\frac{1+7i}{(2-i)^2} =$

(A) $\sqrt{2}\left(\cos\frac{3\pi}{4} + i\sin\frac{3\pi}{4}\right)$

(B) $\sqrt{2}\left(\cos\frac{\pi}{4} + i\sin\frac{\pi}{4}\right)$

(C) $\left(\cos\frac{3\pi}{4} + i\sin\frac{3\pi}{4}\right)$

(D) None of these

49. If $z = re^{i\theta}$, then $|e^{iz}| =$

(A) $e^{r\sin\theta}$ (B) $e^{-r\sin\theta}$

(C) $e^{-r\cos\theta}$ (D) $e^{r\cos\theta}$

50. $\frac{1-i}{1+i}$ is equal to

(A) $\cos\frac{\pi}{2} + i\sin\frac{\pi}{2}$ (B) $\cos\frac{\pi}{2} - i\sin\frac{\pi}{2}$

(C) $\sin\frac{\pi}{2} + i\cos\frac{\pi}{2}$ (D) None of these

51. The amplitude of $e^{e^{-i\theta}}$ is equal to

(A) $\sin\theta$ (B) $-\sin\theta$

(C) $e^{\cos\theta}$ (D) $e^{\sin\theta}$

52. If $z = \frac{1+i\sqrt{3}}{\sqrt{3}+i}$, then $(\bar{z})^{100}$ lies in

(A) I quadrant (B) II quadrant

(C) III quadrant (D) IV quadrant

53. If $x + \frac{1}{x} = \sqrt{3}$, then $x =$

(A) $\cos\frac{\pi}{3} + i\sin\frac{\pi}{3}$ (B) $\cos\frac{\pi}{2} + i\sin\frac{\pi}{2}$

(C) $\sin\frac{\pi}{6} + i\cos\frac{\pi}{6}$ (D) $\cos\frac{\pi}{6} + i\sin\frac{\pi}{6}$

54. $(-1+i\sqrt{3})^{20}$ is equal to

(A) $2^{20}(-1+i\sqrt{3})^{20}$ (B) $2^{20}(1-i\sqrt{3})^{20}$

(C) $2^{20}(-1-i\sqrt{3})^{20}$ (D) None of these

55. The imaginary part of $\tan^{-1}\left(\frac{5i}{3}\right)$ is

(A) 0 (B) ∞

(C) $\log 2$ (D) $\log 4$

Geometry of complex numbers

56. The vertices B and D of a parallelogram are $1-2i$ and $4+2i$, If the diagonals are at right angles and $AC = 2BD$, the complex number representing A is

(A) $\frac{5}{2}$ (B) $3i-\frac{3}{2}$

(C) $3i-4$ (D) $3i+4$

57. If z_1, z_2, z_3, z_4 are the affixes of four points in the Argand plane and z is the affix of a point such that $|z-z_1| = |z-z_2| = |z-z_3| = |z-z_4|$, then z_1, z_2, z_3, z_4 are

(A) Concyclic

(B) Vertices of a parallelogram

(C) Vertices of a rhombus

(D) In a straight line

58. ABCD is a rhombus. Its diagonals AC and BD intersect at the point M and satisfy $BD = 2AC$. If the points D and M represents the complex numbers $1+i$ and $2-i$ respectively, then A represents the complex number

(A) $3-\frac{1}{2}i$ or $1-\frac{3}{2}i$ (B) $\frac{3}{2}-i$ or $\frac{1}{2}-3i$

(C) $\frac{1}{2}-i$ or $1-\frac{1}{2}i$ (D) None of these

59. The complex numbers z_1, z_2, z_3 are the vertices of a triangle. Then the complex numbers z which make the triangle into a parallelogram is

(A) $z_1+z_2-z_3$ (B) $z_1-z_2+z_3$

(C) $z_2+z_3-z_1$ (D) All the above

60. The equation $z\bar{z}+(2-3i)z+(2+3i)\bar{z}+4=0$ represents a circle of radius

(A) 2 (B) 3

(C) 4 (D) 6

61. If z_1, z_2, z_3 are three collinear points in argand plane, then $\begin{vmatrix} z_1 & \bar{z}_1 & 1 \\ z_2 & \bar{z}_2 & 1 \\ z_3 & \bar{z}_3 & 1 \end{vmatrix} =$

(A) 0 (B) – 1

(C) 1 (D) 2

62. If z is a complex number in the Argand plane, then the equation $|z-2|+|z+2|=8$ represents

(A) Parabola (B) Ellipse

(C) Hyperbola (D) Circle

63. The points $1+3i, 5+i$ and $3+2i$ in the complex plane are

(A) Vertices of a right angled triangle

(B) Collinear

(C) Vertices of an obtuse angled triangle

(D) Vertices of an equilateral triangle

64. If z_1 and z_2 are two complex numbers, then $|z_1+z_2|$ is

(A) $\le |z_1|+|z_2|$ (B) $\le |z_1|-|z_2|$

(C) $<|z_1|+|z_2|$ (D) $>|z_1|+|z_2|$

65. If $z = x+iy$, then area of the triangle whose vertices are points z, iz and $z+iz$ is

(A) $2|z|^2$ (B) $\frac{1}{2}|z|^2$

(C) $|z|^2$ (D) $\frac{3}{2}|z|^2$

66. When $\frac{z+i}{z+2}$ is purely imaginary, the locus described by the point z in the Argand diagram is a

(A) Circle of radius $\frac{\sqrt{5}}{2}$
(B) Circle of radius $\frac{5}{4}$
(C) Straight line
(D) Parabola

67. If $|z+1| = \sqrt{2}\,|z-1|$, then the locus described by the point z in the Argand diagram is a

(A) Straight line (B) Circle
(C) Parabola (D) None of these

68. The region of the complex plane for which $\left|\frac{z-a}{z+\bar{a}}\right| = 1 \quad [R(a) \neq 0]$ is

(A) $x-$axis
(B) $y-$axis
(C) The straight line $x = a$
(D) None of these

69. The region of Argand plane defined by $|z-1| + |z+1| \leq 4$ is

(A) Interior of an ellipse
(B) Exterior of a circle
(C) Interior and boundary of an ellipse
(D) None of these

70. The locus of the points *z* which satisfy the condition *arg* $\left(\frac{z-1}{z+1}\right) = \frac{\pi}{3}$ is

(A) A straight line (B) A circle
(C) A parabola (D) None of these

71. Locus of the point *z* satisfying the equation $|iz-1| + |z-i| = 2$ is

(A) A straight line
(B) A circle
(C) An ellipse
(D) A pair of straight lines

72. If $z = x + iy$ is a complex number satisfying $\left|z+\frac{i}{2}\right|^2 = \left|z-\frac{i}{2}\right|^2$, then the locus of *z* is

(A) $2y = x$ (B) $y = x$
(C) *y*-axis (D) *x*-axis

73. The locus of the point *z* satisfying $\arg\left(\frac{z-1}{z+1}\right) = k$, (where *k* is non zero) is

(A) Circle with centre on *y*–axis
(B) Circle with centre on *x*–axis
(C) A straight line parallel to *x*–axis
(D) A straight line making an angle 60° with the *x*–axis

74. If the amplitude of $z-2-3i$ is $\pi/4$, then the locus of $z = x + iy$ is

(A) $x+y-1=0$ (B) $x-y-1=0$
(C) $x+y+1=0$ (D) $x-y+1=0$

75. If $|z^2-1| = |z|^2 + 1$, then z lies on

(A) An ellipse
(B) The imaginary axis
(C) A circle
(D) The real axis

De Moivre's theorem and Roots of unity

76. If $\left(\frac{1+\cos\theta+i\sin\theta}{i+\sin\theta+i\cos\theta}\right)^4 = \cos n\theta + i\sin n\theta$, then n is equal to

(A) 1 (B) 2
(C) 3 (D) 4

77. The value of expression $\left(\cos\frac{\pi}{2}+i\sin\frac{\pi}{2}\right)\left(\cos\frac{\pi}{2^2}+i\sin\frac{\pi}{2^2}\right)$........to ∞ is

(A) -1 (B) 1
(C) 0 (D) 2

78. $\left(\dfrac{\cos\theta + i\sin\theta}{\sin\theta + i\cos\theta}\right)^4$ equals

(A) $\sin 8\theta - i\cos 8\theta$ (B) $\cos 8\theta - i\sin 8\theta$

(C) $\sin 8\theta + i\cos 8\theta$ (D) $\cos 8\theta + i\sin 8\theta$

79. If $\sin\alpha + \sin\beta + \sin\gamma = 0 = \cos\alpha + \cos\beta + \cos\gamma$, then the value of $\sin^2\alpha + \sin^2\beta + \sin^2\gamma$ is

(A) 2/3 (B) 3/2

(C) 1/2 (D) 1

80. If $\cos\alpha + \cos\beta + \cos\gamma = 0 = \sin\alpha + \sin\beta + \sin\gamma$ then $\cos 2\alpha + \cos 2\beta + \cos 2\gamma$ equals

(A) $2\cos(\alpha+\beta+\gamma)$ (B) $\cos 2(\alpha+\beta+\gamma)$

(C) 0 (D) 1

81. $\left(\dfrac{1+\sin\theta + i\cos\theta}{1+\sin\theta - i\cos\theta}\right)^n =$

(A) $\cos\left(\dfrac{n\pi}{2} - n\theta\right) + i\sin\left(\dfrac{n\pi}{2} - n\theta\right)$

(B) $\cos\left(\dfrac{n\pi}{2} + n\theta\right) + i\sin\left(\dfrac{n\pi}{2} + n\theta\right)$

(C) $\sin\left(\dfrac{n\pi}{2} - n\theta\right) + i\cos\left(\dfrac{n\pi}{2} - n\theta\right)$

(D) $\cos n\left(\dfrac{\pi}{2} + 2\theta\right) + i\sin n\left(\dfrac{\pi}{2} + 2\theta\right)$

82. If *n* is a positive integer, then $(1+i)^n + (1-i)^n$ is equal to

(A) $(\sqrt{2})^{n-2}\cos\left(\dfrac{n\pi}{4}\right)$

(B) $(\sqrt{2})^{n-2}\sin\left(\dfrac{n\pi}{4}\right)$

(C) $(\sqrt{2})^{n+2}\cos\left(\dfrac{n\pi}{4}\right)$

(D) $(\sqrt{2})^{n+2}\sin\left(\dfrac{n\pi}{4}\right)$

83. If $\dfrac{1}{x} + x = 2\cos\theta$, then $x^n + \dfrac{1}{x^n}$ is equal to

(A) $2\cos n\theta$ (B) $2\sin n\theta$

(C) $\cos n\theta$ (D) $\sin n\theta$

84. If $iz^4 + 1 = 0$, then z can take the value

(A) $\dfrac{1+i}{\sqrt{2}}$ (B) $\cos\dfrac{\pi}{8} + i\sin\dfrac{\pi}{8}$

(C) $\dfrac{1}{4i}$ (D) i

85. The two numbers such that each one is square of the other, are

(A) ω, ω^3 (B) $-i, i$

(C) $-1, 1$ (D) ω, ω^2

86. If ω is a complex cube root of unity, then $(1+\omega)(1+\omega^2)\ (1+\omega^4)(1+\omega^8)\ldots$ to $2n$ factors =

(A) 0 (B) 1

(C) -1 (D) None of these

87. The product of all the roots of $\left(\cos\dfrac{\pi}{3} + i\sin\dfrac{\pi}{3}\right)^{3/4}$ is

(A) -1 (B) 1

(C) $\dfrac{3}{2}$ (D) $-\dfrac{1}{2}$

88. If ω is a cube root of unity, then a root of the equation $\begin{vmatrix} x+1 & \omega & \omega^2 \\ \omega & x+\omega^2 & 1 \\ \omega^2 & 1 & x+\omega \end{vmatrix} = 0$ is

(A) $x = 1$ (B) $x = \omega$

(C) $x = \omega^2$ (D) $x = 0$

89. If $x = a+b, y = a\alpha + b\beta$ and $z = a\beta + b\alpha$, where α and β are complex cube roots of unity, then xyz =

(A) $a^2 + b^2$ (B) $a^3 + b^3$

(C) a^3b^3 (D) $a^3 - b^3$

90. If $x = a + b, y = a\omega + b\omega^2, z = a\omega^2 + b\omega$, then the value of $x^3 + y^3 + z^3$ is equal to

(A) $a^3 + b^3$ (B) $3(a^3 + b^3)$

(C) $3(a^2 + b^2)$ (D) None of these

91. The n^{th} roots of unity are in

(A) A.P. (B) G.P.

(C) H.P. (D) None of these

92. If $1, \omega, \omega^2$ are the three cube roots of unity, then $(3 + \omega^2 + \omega^4)^6 =$

(A) 64 (B) 729

(C) 2 (D) 0

93. $(1 - \omega + \omega^2)(1 - \omega^2 + \omega^4)(1 - \omega^4 + \omega^8)$.......... to $2n$ factors is

(A) 2^n (B) 2^{2n}

(C) 0 (D) 1

94. Let $\Delta = \begin{vmatrix} 1 & \omega & 2\omega^2 \\ 2 & 2\omega^2 & 4\omega^3 \\ 3 & 3\omega^3 & 6\omega^4 \end{vmatrix}$ where ω is the cube root of unity, then

(A) $\Delta = 0$ (B) $\Delta = 1$

(C) $\Delta = 2$ (D) $\Delta = 3$

95. If n is a positive integer greater than unity and z is a complex number satisfying the equation $z^n = (z + 1)^n$, then

(A) $\text{Re}(z) < 0$ (B) $\text{Re}(z) > 0$

(C) $\text{Re}(z) = 0$ (D) None of these

96. $\left(\frac{\sqrt{3} + i}{2}\right)^6 + \left(\frac{i - \sqrt{3}}{2}\right)^6$ is equal to

(A) -2 (B) 0

(C) 2 (D) 1

97. If ω is an imaginary cube root of unity, $(1 + \omega - \omega^2)^7$ equals

(A) 128ω (B) -128ω

(C) $128\omega^2$ (D) $-128\omega^2$

98. $\frac{(-1 + i\sqrt{3})^{15}}{(1 - i)^{20}} + \frac{(-1 - i\sqrt{3})^{15}}{(1 + i)^{20}}$ is equal to

(A) – 64 (B) – 32

(C) – 16 (D) $\frac{1}{16}$

99. If $\pi / 3$ is a complex root of the equation $z^3 = 1$, then $\omega + \omega^{\left(\frac{1}{2} + \frac{3}{8} + \frac{9}{32} + \frac{27}{128} + ...\right)}$ is equal to

(A) – 1 (B) 0

(C) 9 (D) *i*

100. If cube root of 1 is ω, then the value of $(3 + \omega + 3\omega^2)^4$ is

(A) 0 (B) 16

(C) 16ω (D) $16\omega^2$

101. The value of $(8)^{1/3}$ is

(A) $-1 + i\sqrt{3}$ (B) $-1 - i\sqrt{3}$

(C) 2 (D) All of these

102. If ω is a complex cube root of unity, then $225 + (3\omega + 8\omega^2)^2 + (3\omega^2 + 8\omega)^2 =$

(A) 72 (B) 192

(C) 200 (D) 248

103. If $1, \omega, \omega^2$ are the cube roots of unity, then

$$\Delta = \begin{vmatrix} 1 & \omega^n & \omega^{2n} \\ \omega^n & \omega^{2n} & 1 \\ \omega^{2n} & 1 & \omega^n \end{vmatrix} =$$

(A) 0 (B) 1

(C) ω (D) ω^2

104. If $\omega = \frac{-1 + \sqrt{3}i}{2}$ then $(3 + \omega + 3\omega^2)^4 =$

(A) 16 (B) –16

(C) 16 ω (D) $16\omega^2$

105. If $1, \omega, \omega^2$ are the roots of unity, then $(1 - 2\omega + \omega^2)^6$ is equal to

(A) 729 (B) 246

(C) 243 (D) 81

QUADRATIC EQUATION

Solution of quadratic equations and Nature of roots

1. If $x^2+y^2=25, xy=12$, then $x=$

(A) {3, 4} (B) {3, –3}

(C) {3, 4, –3, –4} (D) {–3, –3}

2. The solution set of the equation $x^{\log_x(1-x)^2}=9$ is

(A) {– 2, 4} (B) {4}

(C) {0, – 2, 4} (D) None of these

3. Let one root of $ax^2+bx+c=0$ where a, b, c are integers be $3+\sqrt{5}$, then the other root is

(A) $3-\sqrt{5}$ (B) 3

(C) $\sqrt{5}$ (D) None of these

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

(A) 1 (B) 2

(C) 3 (D) 4

5. The number of real roots of the equation $e^{\sin x}-e^{-\sin x}-4=0$ are

(A) 1 (B) 2

(C) Infinite (D) None

6. The number of real solutions of the equation $|x^2+4x+3|+2x+5=0$ are

(A) 1 (B) 2

(C) 3 (D) 4

7. The roots of the given equation $(p-q)x^2+(q-r)x+(r-p)=0$ are

(A) $\frac{p-q}{r-p}, 1$ (B) $\frac{q-r}{p-q}, 1$

(C) $\frac{r-p}{p-q}, 1$ (D) $1, \frac{q-r}{p-q}$

8. If a root of the equation $x^2+px+12=0$ is 4, while the roots of the equation $x^2+px+q=0$ are same, then the value of q will be

(A) 4 (B) 4/49

(C) 49/4 (D) None of these

9. How many roots the equation $x-\frac{2}{x-1}=1-\frac{2}{x-1}$ have

(A) One (B) Two

(C) Infinite (D) None

10. The solution of the equation $x+\frac{1}{x}=2$ will be

(A) 2, –1 (B) $0, -1, -\frac{1}{5}$

(C) $-1, -\frac{1}{5}$ (D) None of these

11. If $\log_2 x+\log_x 2=\frac{10}{3}=\log_2 y+\log_y 2$ and $x\neq y$, then $x+y=$

(A) 2 (B) 65/8

(C) 37/6 (D) None of these

12. The value of $x=\sqrt{2+\sqrt{2+\sqrt{2+.....}}}$ is

(A) –1 (B) 1

(C) 2 (D) 3

13. The value of x in the given equation $4^x-3^{x-\frac{1}{2}}=3^{x+\frac{1}{2}}-2^{2x-1}$ is

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

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

14. The equation $e^x - x - 1 = 0$ has

(A) Only one real root $x = 0$

(B) At least two real roots

(C) Exactly two real roots

(D) Infinitely many real roots

15. The equation $\sqrt{(x+1)} - \sqrt{(x-1)} = \sqrt{(4x-1)}$ has

(A) No solution

(B) One solution

(C) Two solutions

(D) More than two solutions

16. The equation $\log_e x + \log_e (1+x) = 0$ can be written as

(A) $x^2 + x - e = 0$ (B) $x^2 + x - 1 = 0$

(C) $x^2 + x + 1 = 0$ (D) $x^2 + xe - e = 0$

17. If $x = \sqrt{6 + \sqrt{6 + \sqrt{6 + ...\text{to } \infty}}}$, then

(A) x is an irrational number

(B) $2 < x < 3$

(C) $x = 3$

(D) None of these

18. The real roots of the equation $x^2 + 5|x| + 4 = 0$ are

(A) – 1, 4 (B) 1, 4

(C) – 4, 4 (D) None of these

19. A real root of the equation $\log_4\{\log_2(\sqrt{x+8} - \sqrt{x})\} = 0$ is

(A) 1 (B) 2

(C) 3 (D) 4

20. $\{x \in R : |x - 2| = x^2\} =$

(A) $\{-1, 2\}$ (B) $\{1, 2\}$

(C) $\{-1, -2\}$ (D) $\{1, -2\}$

21. The roots of the given equation $2(a^2 + b^2)x^2 + 2(a+b)x + 1 = 0$ are

(A) Rational (B) Irrational

(C) Real (D) Imaginary

22. If the roots of the equations $px^2 + 2qx + r = 0$ and $qx^2 - 2\sqrt{pr}x + q = 0$ be real, then

(A) $p = q$ (B) $q^2 = pr$

(C) $p^2 = qr$ (D) $r^2 = pq$

23. If the roots of the equation $ax^2 + x + b = 0$ be real, then the roots of the equation $x^2 - 4\sqrt{ab}x + 1 = 0$ will be

(A) Rational (B) Irrational

(C) Real (D) Imaginary

24. If one of the roots of the equation $x^2 + ax + b = 0$ and $x^2 + bx + a = 0$ is coincident, then the numerical value of $(a+b)$ is

(A) 0 (B) – 1

(C) 2 (D) 5

25. The equation $x^{(3/4)(\log_2 x)^2 + (\log_2 x) - 5/4} = \sqrt{2}$ has

(A) At least one real solution

(B) Exactly three real solutions

(C) Exactly one irrational solution

(D) All the above

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

(A) Are real and negative

(B) Have negative real parts

(C) Are rational numbers

(D) None of these

27. The value of k for which $2x^2 - kx + x + 8 = 0$ has equal and real roots are

(A) –9 and –7 (B) 9 and 7

(C) –9 and 7 (D) 9 and –7

28. The roots of the quadratic equation $2x^2 + 3x + 1 = 0$, are

(A) Irrational (B) Rational

(C) Imaginary (D) None of these

29. If l, m, n are real and $l \neq m$, then the roots of the equation

$(l-m)x^2 - 5(l+m)x - 2(l-m) = 0$ are

(A) Complex

(B) Real and distinct

(C) Real and equal

(D) None of these

30. If the roots of the equation $x^2 - 8x + (a^2 - 6a) = 0$ are real, then

(A) $-2 < a < 8$ (B) $2 < a < 8$

(C) $-2 \le a \le 8$ (D) $2 \le a \le 8$

31. The condition for the roots of the equation,

$(c^2 - ab)x^2 - 2(a^2 - bc)x + (b^2 - ac) = 0$

to be equal is

(A) $a = 0$ (B) $b = 0$

(C) $c = 0$ (D) None of these

32. If $b_1 b_2 = 2\,(c_1 + c_2)$, then at least one of the equations $x^2 + b_1 x + c_1 = 0$ and $x^2 + b_2 x + c_2 = 0$ has

(A) Real roots

(B) Purely imaginary roots

(C) Imaginary roots

(D) None of these

33. The value of k for which the quadratic equation, $kx^2 + 1 = kx + 3x - 11x^2$ has real and equal roots are

(A) $-11, -3$ (B) $5, 7$

(C) $5, -7$ (D) None of these

34. The expression $y = ax^2 + bx + c$ has always the same sign as *c* if

(A) $4ac < b^2$ (B) $4ac > b^2$

(C) $ac < b^2$ (D) $ac > b^2$

35. The value of *m* for which the equation

$$\frac{a}{x+a+m} + \frac{b}{x+b+m} = 1$$

has roots equal in magnitude but opposite in sign is

(A) $\frac{a+b}{a-b}$ (B) 0

(C) $\frac{a-b}{a+b}$ (D) $\frac{2(a-b)}{a+b}$

36. The roots of the equation

$(a^2 + b^2)t^2 - 2(ac + bd)t + (c^2 + d^2) = 0$

are equal, then

(A) $ab = dc$ (B) $ac = bd$

(C) $ad + bc = 0$ (D) $\frac{a}{b} = \frac{c}{d}$

37. For what values of *k* will the equation $x^2 - 2(1+3k)x + 7(3+2k) = 0$ have equal roots

(A) $1, -\frac{10}{9}$ (B) $2, -\frac{10}{9}$

(C) $3, -\frac{10}{9}$ (D) $4, -\frac{10}{9}$

38. If the roots of equation $x^2 + a^2 = 8x + 6a$ are real, then

(A) $a \in [2, 8]$ (B) $a \in [-2, 8]$

(C) $a \in (2, 8)$ (D) $a \in (-2, 8)$

39. Let $p, q \in \{1, 2, 3, 4\}$. The number of equations of the form $px^2 + qx + 1 = 0$ having real roots is

(A) 15 (B) 9

(C) 7 (D) 8

40. For what value of *k* will the equation $x^2 - (3k-1)x + 2k^2 + 2k$ have equal roots

(A) 5 (B) 9

(C) Both (A) and (B) (D) 0

Relation between roots and coefficients

41. If α and β are the roots of the equation $2x^2 - 3x + 4 = 0$, then the equation whose roots are α^2 and β^2 is

(A) $4x^2 + 7x + 16 = 0$

(B) $4x^2 + 7x + 6 = 0$

(C) $4x^2 + 7x + 1 = 0$

(D) $4x^2 - 7x + 16 = 0$

42. If α and β are the roots of the equation $x^2 - a(x+1) - b = 0$ then $(\alpha+1)(\beta+1) =$

(A) b (B) $-b$

(C) $1-b$ (D) $b-1$

43. If α, β be the roots of the equation $2x^2 - 2(m^2+1)x + m^4 + m^2 + 1 = 0$, then $\alpha^2 + \beta^2 =$

(A) 0 (B) 1

(C) m (D) m^2

44. If the ratio of the roots of the equation $ax^2 + bx + c = 0$ be $p : q$, then

(A) $pqb^2 + (p+q)^2 ac = 0$

(B) $pqb^2 - (p+q)^2 ac = 0$

(C) $pqa^2 - (p+q)^2 bc = 0$

(D) None of these

45. If α, β are the roots of the equation $ax^2 + bx + c = 0$, then $\frac{\alpha}{a\beta + b} + \frac{\beta}{a\alpha + b} =$

(A) $\frac{2}{a}$ (B) $\frac{2}{b}$

(C) $\frac{2}{c}$ (D) $-\frac{2}{a}$

46. If the sum of the roots of the equation $ax^2 + bx + c = 0$ be equal to the sum of their squares, then

(A) $a(a+b) = 2bc$ (B) $c(a+c) = 2ab$

(C) $b(a+b) = 2ac$ (D) $b(a+b) = ac$

47. If the roots of the equation $\frac{\alpha}{x-\alpha} + \frac{\beta}{x-\beta} = 1$ be equal in magnitude but opposite in sign, then $\alpha + \beta =$

(A) 0 (B) 1

(C) 2 (D) None of these

48. If α, β be the roots of the equation $x^2 - 2x + 3 = 0$, then the equation whose roots are $\frac{1}{\alpha^2}$ and $\frac{1}{\beta^2}$ is

(A) $x^2 + 2x + 1 = 0$ (B) $9x^2 + 2x + 1 = 0$

(C) $9x^2 - 2x + 1 = 0$ (D) $9x^2 + 2x - 1 = 0$

49. If α, β are the roots of $x^2 + px + 1 = 0$ and γ, δ are the roots of $x^2 + qx + 1 = 0$, then $q^2 - p^2 =$

(A) $(\alpha - \gamma)(\beta - \gamma)(\alpha + \delta)(\beta + \delta)$

(B) $(\alpha + \gamma)(\beta + \gamma)(\alpha - \delta)(\beta + \delta)$

(C) $(\alpha + \gamma)(\beta + \gamma)(\alpha + \delta)(\beta + \delta)$

(D) None of these

50. If α, β be the roots of $x^2 - px + q = 0$ and α', β' be the roots of $x^2 - p'x + q' = 0$, then the value of $(\alpha - \alpha')^2 + (\beta - \alpha')^2 + (a - \beta')^2 + (\beta - \beta')^2$ is

(A) $2\{p^2 - 2q + p'^2 - 2q' - pp'\}$

(B) $2\{p^2 - 2q + p'^2 - 2q' - qq'\}$

(C) $2\{p^2 - 2q - p'^2 - 2q' - pp'\}$

(D) $2\{p^2 - 2q - p'^2 - 2q' - qq'\}$

51. If the roots of the equation $Ax^2 + Bx + C = 0$ are α, β and the roots of the equation $x^2 + px + q = 0$ are α^2, β^2, then value of p will be

(A) $\frac{B^2 - 2AC}{A^2}$ (B) $\frac{2AC - B^2}{A^2}$

(C) $\frac{B^2 - 4AC}{A^2}$ (D) None of these

52. The quadratic equation whose one root is $\frac{1}{2+\sqrt{5}}$ will be

(A) $x^2+4x-1=0$

(B) $x^2+4x+1=0$

(C) $x^2-4x-1=0$

(D) $\sqrt{2}x^2-4x+1=0$

53. If the roots of the equation $x^2+x+1=0$ are α,β and the roots of the equation $x^2+px+q=0$ are $\frac{\alpha}{\beta},\frac{\beta}{\alpha}$ then p is equal to

(A) –2 (B) –1

(C) 1 (D) 2

54. If α,β are the roots of the equation $x^2+ax+b=0$ then the value of $\alpha^3+\beta^3$ is equal to

(A) $-(a^3+3ab)$ (B) a^3+3ab

(C) $-a^3+3ab$ (D) a^3-3ab

55. If the sum of the roots of the equation $x^2+px+q=0$ is three times their difference, then which one of the following is true

(A) $9p^2=2q$ (B) $2q^2=9p$

(C) $2p^2=9q$ (D) $9q^2=2p$

56. If the roots of the equation $x^2+2mx+m^2-2m+6=0$ are same, then the value of *m* will be

(A) 3 (B) 0

(C) 2 (D) –1

57. If the roots of the given equation $(2k+1)x^2-(7k+3)x+k+2=0$ are reciprocal to each other, then the value of *k* will be

(A) 0 (B) 1

(C) 2 (D) 3

58. If the roots of the equation $ax^2+bx+c=0$ are l and $2l$, then

(A) $b^2=9ac$ (B) $2b^2=9ac$

(C) $b^2=-4ac$ (D) $a^2=c^2$

59. The sum of the roots of a equation is 2 and sum of their cubes is 98, then the equation is

(A) $x^2+2x+15=0$ (B) $x^2+15x+2=0$

(C) $2x^2-2x+15=0$ (D) $x^2-2x-15=0$

60. If the roots of the equation $ax^2+bx+c=0$ are α,β, then the value of $\alpha\beta^2+\alpha^2\beta+\alpha\beta$ will be

(A) $\frac{c(a-b)}{a^2}$ (B) 0

(C) $-\frac{bc}{a^2}$ (D) None of these

61. If the roots of the equation $ax^2+bx+c=0$ are real and of the form $\frac{\alpha}{\alpha-1}$ and $\frac{\alpha+1}{\alpha}$, then the value of $(a+b+c)^2$ is

(A) b^2-4ac (B) b^2-2ac

(C) $2b^2-ac$ (D) None of these

62. If the ratio of the roots of $ax^2+2bx+c=0$ is same as the ratio of the roots of $px^2+2qx+r=0$, then

(A) $\frac{b}{ac}=\frac{q}{pr}$ (B) $\frac{b^2}{ac}=\frac{q^2}{pr}$

(C) $\frac{2b}{ac}=\frac{q^2}{pr}$ (D) None of these

63. Roots of the equation $x^2+bx-c=0 (b,c>0)$ are

(A) Both positive (B) Both negative

(C) Of opposite sign (D) None of these

64. If p and q are the roots of the equation $x^2+pq=(p+1)x$, then q=

(A) –1 (B) 1
(C) 2 (D) None of these

65. If the roots of $ax^2+bx+c=0$ are α,β and the roots of $Ax^2+Bx+C=0$ are $\alpha-k,\beta-k$, then $\frac{B^2-4AC}{b^2-4ac}$ is equal to

(A) 0 (B) 1
(C) $\left(\frac{A}{a}\right)^2$ (d) $\left(\frac{a}{A}\right)^2$

66. If p and q are the roots of $x^2+px+q=0$, then

(A) $p=1, q=-2$ (B) $p=-2, q=1$
(C) $p=1, q=0$ (D) $p=-2, q=0$

67. If one root of the quadratic equation, $ix^2-2(i+1)x+(2-i)=0$ is $2-i$, then the other root is

(A) $-i$ (B) i
(C) $2+i$ (D) $2-i$

68. If the roots of equation $5x^2-7x+k=0$ are reciprocal to each other, then value of k is

(A) 5 (B) 2
(C) 1/5 (D) 1

69. If roots of $x^2-7x+6=0$ are α,β, then $\frac{1}{\alpha}+\frac{1}{\beta}=$

(A) 6/7 (B) 7/6
(C) 7/10 (D) 8/9

70. If α,β are the roots of $x^2-2x+4=0$, then $\alpha^5+\beta^5$ is equal to

(A) 16 (B) 32
(C) 64 (D) None of these

71. The harmonic mean of the roots of the equation $(5+\sqrt{2})x^2-(4+\sqrt{5})x+8+2\sqrt{5}=0$ is

(A) 2 (B) 4
(C) 6 (D) 8

72. If the roots of $x^2-bx+c=0$ are two consecutive integers, then b^2-4c is

(A) 1 (B) 2
(C) 3 (D) 4

73. If α and β are roots of the equation $Ax^2+Bx+C=0$, then value of $\alpha^3+\beta^3$ is

(A) $\frac{3ABC-B^3}{A^3}$ (B) $\frac{3ABC+B^3}{A^3}$
(C) $\frac{B^3-3ABC}{A^3}$ (D) $\frac{B^3-3ABC}{B^3}$

74. If α,β are the roots of the equation $x^2-(1+n^2)x+\frac{1}{2}(1+n^2+n^4)=0$ then the value of $\alpha^2+\beta^2$ is

(A) $2n$ (B) n^3
(C) n^2 (D) $2n^2$

75. The value of p for which one root of the equation $x^2-30x+p=0$ is the square of the other, are

(A) 125 only (B) 125 and –216
(C) 125 and 215 (D) 216 only

76. What is the sum of the squares of roots of $x^2-3x+1=0$

(A) 5 (B) 7
(C) 9 (D) 10

77. Sum of roots is –1 and sum of their reciprocals is $\frac{1}{6}$, then equation is

(A) $x^2+x-6=0$ (B) $x^2-x+6=0$
(C) $6x^2+x+1=0$ (D) $x^2-6x+1=0$

78. If the sum of the roots of the equation $x^2 + px + q = 0$ is equal to the sum of their squares, then

(A) $p^2 - q^2 = 0$ (B) $p^2 + q^2 = 2q$

(C) $p^2 + p = 2q$ (D) None of these

79. If α, β are roots of $x^2 - 3x + 1 = 0$, then the equation whose roots are $\frac{1}{\alpha - 2}, \frac{1}{\beta - 2}$ is

(A) $x^2 + x - 1 = 0$ (B) $x^2 + x + 1 = 0$

(C) $x^2 - x - 1 = 0$ (D) None of these

80. The equation formed by decreasing each root of $ax^2 + bx + c = 0$ by 1 is $2x^2 + 8x + 2 = 0$, then

(A) $a = -b$ (B) $b = -c$

(C) $c = -a$ (D) $b = a + c$

81. If $\alpha \neq \beta$ but $\alpha^2 = 5\alpha - 3$ and $\beta^2 = 5\beta - 3$, then the equation whose roots are α/β and β/α is

(A) $3x^2 - 25x + 3 = 0$

(B) $x^2 + 5x - 3 = 0$

(C) $x^2 - 5x + 3 = 0$

(D) $3x^2 - 19x + 3 = 0$

82. Difference between the corresponding roots of $x^2 + ax + b = 0$ and $x^2 + bx + a = 0$ is same and $a \neq b$, then

(A) $a + b + 4 = 0$ (B) $a + b - 4 = 0$

(C) $a - b - 4 = 0$ (D) $a - b + 4 = 0$

83. Product of real roots of the equation $t^2x^2 + |x| + 9 = 0$

(A) Is always positive

(B) Is always negative

(C) Does not exist

(D) None of these

84. If the roots of the equation $12x^2 - mx + 5 = 0$ are in the ratio 2 : 3, then $m =$

(A) $5\sqrt{10}$ (B) $3\sqrt{10}$

(C) $2\sqrt{10}$ (D) None of these

85. If one root of the equation $x^2 + px + q = 0$ is $2 + \sqrt{3}$, then values of p and q are

(A) – 4, 1 (B) 4, – 1

(C) 2, $\sqrt{3}$ (D) $-2, -\sqrt{3}$

86. The condition that one root of the equation $ax^2 + bx + c = 0$ is three times the other is

(A) $b^2 = 8ac$ (B) $3b^2 + 16ac = 0$

(C) $3b^2 = 16ac$ (D) $b^2 + 3ac = 0$

87. The equation whose roots are reciprocal of the roots of the equation $3x^2 - 20x + 17 = 0$ is

(A) $3x^2 + 20x - 17 = 0$

(B) $17x^2 - 20x + 3 = 0$

(C) $17x^2 + 20x + 3 = 0$

(D) None of these

88. If α, β are the roots of the equation $x^2 + 2x + 4 = 0$, then $\frac{1}{\alpha^3} + \frac{1}{\beta^3}$ is equal to

(A) $-\frac{1}{2}$ (B) $\frac{1}{2}$

(C) 32 (D) $\frac{1}{4}$

89. The equation of the smallest degree with real coefficients having $1 + i$ as one of the root is

(A) $x^2 + x + 1 = 0$ (B) $x^2 - 2x + 2 = 0$

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

90. Let two numbers have arithmetic mean 9 and geometric mean 4. Then these numbers are the roots of the quadratic equation

(A) $x^2 - 18x - 16 = 0$

(B) $x^2 - 18x + 16 = 0$

(C) $x^2 + 18x - 16 = 0$

(D) $x^2 + 18x + 16 = 0$

Condition for common roots, Quadratic expressions and Position of roots

91. If x be real, then the minimum value of $x^2 - 8x + 17$ is
(A) –1 (B) 0
(C) 1 (D) 2

92. If x is real, then the maximum and minimum values of expression $\dfrac{x^2 + 14x + 9}{x^2 + 2x + 3}$ will be
(A) 4, – 5 (B) 5, – 4
(C) – 4, 5 (D) – 4, – 5

93. If x is real, the expression $\dfrac{x+2}{2x^2 + 3x + 6}$ takes all value in the interval
(A) $\left(\frac{1}{13}, \frac{1}{3}\right)$ (B) $\left[-\frac{1}{13}, \frac{1}{3}\right]$
(C) $\left(-\frac{1}{3}, \frac{1}{13}\right)$ (D) None of these

94. If $x^2 + px + 1$ is a 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

95. If x, y, z are real and distinct, then $u = x^2 + 4y^2 + 9z^2 - 6yz - 3zx - zxy$ is always
(A) Non-negative (B) Non-positive
(C) Zero (D) None of these

96. If x be real, then the maximum value of $5 + 4x - 4x^2$ will be equal to
(A) 5 (B) 6
(C) 1 (D) 2

97. If x is real, the function $\dfrac{(x-a)(x-b)}{(x-c)}$ will assume all real values, provided
(A) $a > b > c$ (B) $a < b < c$
(C) $a > c < b$ (D) $a < c < b$

98. If x is real, then the maximum and minimum values of the expression $\dfrac{x^2 - 3x + 4}{x^2 + 3x + 4}$ will be
(A) 2, 1 (B) $5, \frac{1}{5}$
(C) $7, \frac{1}{7}$ (D) None of these

99. If x is real, then the value of $\dfrac{x^2 + 34x - 71}{x^2 + 2x - 7}$ does not lie between
(A) –9 and –5 (B) –5 and 9
(C) 0 and 9 (D) 5 and 9

100. If x is real, then the value of $x^2 - 6x + 13$ will not be less than
(A) 4 (B) 6
(C) 7 (D) 8

101. The smallest value of $x^2 - 3x + 3$ in the interval $(-3, 3/2)$ is
(A) 3/4 (B) 5
(C) –15 (D) –20

102. If the roots of $x^2 + x + a = 0$ exceed a, then
(A) $2 < a < 3$ (B) $a > 3$
(C) $-3 < a < 3$ (D) $a < -2$

103. If the roots of the equation $x^2 - 2ax + a^2 + a - 3 = 0$ are real and less than 3, then
(A) $a < 2$ (B) $2 \le a \le 3$
(C) $3 < a \le 4$ (D) $a > 4$

104. If x be real, the least value of $x^2 - 6x + 10$ is
(A) 1 (B) 2
(C) 3 (D) 10

105. Let α, β be the roots of $x^2 + (3-\lambda)x - \lambda = 0$. The value of λ for which $\alpha^2 + \beta^2$ is minimum, is
(A) 0 (B) 1
(C) 2 (D) 3

Solution of quadratic inequations and Miscellaneous equations

106. If $x^2 + 2ax + 10 - 3a > 0$ for all $x \in R$, then

(A) $-5 < a < 2$ (B) $a < -5$

(C) $a > 5$ (D) $2 < a < 5$

107. The roots of the equation $x^4 - 4x^3 + 6x^2 - 4x + 1 = 0$ are

(A) 1, 1, 1, 1 (B) 2, 2, 2, 2

(C) 3, 1, 3, 1 (D) 1, 2, 1, 2

108. If the roots of the equation $8x^3 - 14x^2 + 7x - 1 = 0$ are in G.P., then the roots are

(A) $1, \frac{1}{2}, \frac{1}{4}$ (B) 2, 4, 8

(C) 3, 6, 12 (D) None of these

109. If the sum of the two roots of the equation $4x^3 + 16x^2 - 9x - 36 = 0$ is zero, then the roots are

(A) 1, 2 –2 (B) $-2, \frac{2}{3}, -\frac{2}{3}$

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

110. One root of the following given equation $2x^5 - 14x^4 + 31x^3 - 64x^2 + 19x + 130 = 0$ is

(A) 1 (B) 3

(C) 5 (D) 7

111. If two roots of the equation $x^3 - 3x + 2 = 0$ are same, then the roots will be

(A) 2, 2, 3 (B) 1, 1, –2

(C) – 2, 3, 3 (D) –2, –2, 1

112. If a, b, c are real and $x^3 - 3b^2x + 2c^3$ is divisible by $x - a$ and $x - b$, then

(A) $a = -b = -c$

(B) $a = 2b = 2c$

(C) $a = b = c$, $a = -2b = -2c$

(D) None of these

113. If α, β and γ are the roots of $x^3 + 8 = 0$, then the equation whose roots are α^2, β^2 and γ^2 is

(A) $x^3 - 8 = 0$ (B) $x^3 - 16 = 0$

(C) $x^3 + 64 = 0$ (D) $x^3 - 64 = 0$.

114. If α, β, γ are the roots of the equation $x^3 + 4x + 1 = 0,$

then $(\alpha + \beta)^{-1} + (\beta + \gamma)^{-1} + (\gamma + \alpha)^{-1} =$

(A) 2 (B) 3

(C) 4 (D) 5

115. If the sum of two of the roots of $x^3 + px^2 + qx + r = 0$ is zero, then $pq =$

(A) – r (B) r

(C) 2 r (D) – 2 r