EXERCISE LEVEL – I

EL– I

Q.1 Given that α and β are the roots of the equation $x^2 + 6x + \lambda = 0$ and $3\alpha + 2\beta = -20$, find the value of λ.
(a) –8 (b) –16 (c) 16 (d) 8

Q.2 The quadratic equation with rational coefficients, where one of the roots 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) $\sqrt{2}x^2 - 4x + 1 = 0$

Q.3 A value of k that results in the quadratic equation $x^2 - 2x(1 + 3k) + 7(2k + 3) = 0$ having equal roots is.
(a) 1 (b) 2 (c) 3 (d) 4

Q.4 If the roots of the quadratic equation $x^2 + px + q = 0$ are tan 30° and tan 15° respectively, then the value of 2 + q – p is.
(a) 2 (b) 3 (c) 0 (d) 1

Q.5 If the product of the roots of the equation $(a + 1)x^2 + (2a + 3)x + (3a + 4) = 0$ is 2, then the sum of the roots is.
(a) 1 (b) – 1 (c) 2 (d) –2

Q.6 If α and β are the roots of the equation $ax^2 + bx + c = 0$, then the equation with roots $\alpha + \frac{1}{\beta}$ and $\beta + \frac{1}{\alpha}$ is
(a) $acx^2 + (a + c)bx + (a + c)^2 = 0$ (b) $abx^2 + (a + c)bx + (a + c)^2 = 0$
(c) $acx^2 + (a + b)cx + (a + c)^2 = 0$ (d) $acx^2 - (a + c)bx + (a + c)^2 = 0$

Q.7 If the roots are common for both $k(6x^2 + 3) + rx + 2x^2 - 1 = 0$ and $6k(2x^2 + 1) + px + 4x^2 - 2 = 0$, then 2r – p is equal to.
(a) –1 (b) 0 (c) 1 (d) 2

Q.8 If each pair of equations $x^2 + px + qr = 0$, $x^2 + qx + rp = 0$, $x^2 + rx + pq = 0$ shares a non-zero common root, then the sum of the three common roots is.
(a) $-\frac{(p+q+r)}{2}$ (b) $\frac{-p+q+r}{2}$ (c) $-(p - q + r)$ (d) $-p + q + r$

Q.9 The value of 'a' that minimizes the sum of the squares of the roots for the equation $x^2 - (a - 2)x - a - 1 = 0$ is.
(a) 0 (b) 1 (c) 2 (d) 3

Q.10 If α and β (α < β) 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) $\alpha < 0 < |\alpha| < \beta$

Q.11 The values of λ that result in the equation $2x^2 - 2(2\lambda + 1)x + \lambda(\lambda + 1) = 0$ having one root less than λ and the other root greater than λ are given by.
(a) $\lambda > -1$ (b) $\lambda < 0$ (c) $(-\infty, -1) \cup (0, \infty)$ (d) $\lambda < -1$

Q.12 The value of 'a' that ensures the roots of the equation $(1 - a^2)x^2 + 2ax - 1 = 0$ lie within the interval (0, 1) is.
(a) $a > \frac{1+\sqrt{5}}{2}$ (b) $a > 2$ (c) $\frac{1+\sqrt{5}}{2} < a < 2$ (d) $a > \sqrt{2}$

Q.13 If the sum of two roots of the equation $x^3 - px^2 + qx - r = 0$ is zero, then.
(a) pq = r (b) qr = p (c) pr = q (d) pqr = 1

Q.14 If α, β, and γ represent the roots of the equation $x^3 - 3x^2 + x + 5 = 0$, then $y = \sum\alpha^2 + \alpha\beta\gamma$ satisfies the equation.
(a) $y^3 + y + 2 = 0$ (b) $y^3 - y^2 - y - 2 = 0$
(c) $y^3 + 3y^2 - y - 3 = 0$ (d) $v^3 + 4v^2 + 5v + 20 = 0$

Q.15 The quadratic equation with roots being the reciprocals of the roots of the equation $ax^2 + bx + c = 0$ is.
(a) $cx^2 + bx + a = 0$ (b) $bx^2 + cx + a = 0$
(c) $cx^2 + ax + b = 0$ (d) $bx^2 + ax + c = 0$

Q.16 If α, β, and γ are the roots of the equation $x^3 + 4x + 1 = 0$, then the expression $(\alpha + \beta)^{-1} + (\beta + \gamma)^{-1} + (\gamma + \alpha)^{-1}$ is.
(a) 2 (b) 3 (c) 4 (d) 5

Q.17 If α and β are the roots of the equation $ax^2 + bx + c = 0$, then the equation with roots $2 + \alpha$ and $2 + \beta$ is.
(a) $ax^2 + x(4a - b) + 4a - 2b + c = 0$ (b) $ax^2 + x(4a - b) + 4a + 2b + c = 0$
(c) $ax^2 + x(b - 4a) + 4a + 2b + c = 0$ (d) $ax^2 + x(b - 4a) + 4a - 2b + c = 0$

Q.18 If α and β are the roots of the quadratic equation $x^2 + bx - c = 0$, then the equation with roots b and c is.
(a) $x^2 + \alpha x - \beta = 0$ (b) $x^2 - [(\alpha + \beta) + \alpha\beta]x - \alpha\beta(\alpha + \beta) = 0$
(c) $x^2 + [(\alpha + \beta) + \alpha\beta]x + \alpha\beta(\alpha + \beta) = 0$ (d) $x^2 + [\alpha\beta + (\alpha + \beta)]x - \alpha\beta(\alpha + \beta) = 0$

Q.19 If α, β, and γ are the roots of the equation $x^3 + 8 = 0$, then the equation with roots α^2, β^2, and γ^2 is.
(a) $x^3 - 8 = 0$ (b) $x^3 - 16 = 0$ (c) $x^3 + 64 = 0$ (d) $x^3 - 64 = 0$

Q.20 If the difference of the roots of the equation $x^2 - px + q = 0$ is unity, then
(a) $p^2 + 4q = 1$ (b) $p^2 - 4q = 1$
(c) $p^2 - 4q^2 = (1 + 2q)^2$ (d) $4p^2 + q^2 = (1 + 2p)^2$

Q.21 If α and β are the roots of the equation, $x^2 - px + 16 = 0$, such that $\alpha^2 + \beta^2 = 9$, then the value of p is.
(a) $\pm\sqrt{6}$ (b) $\pm\sqrt{41}$ (c) ± 8 (d) ± 7

Q.22 If $x^2 + px + q$ is an integer for every integral x, then
(a) p is always an integer but q need not be an integer
(b) q is always an integer but p need not be an integer
(c) $(p + q)$ is always an integer for p and q to be non-integers
(d) p and q are always integers

Q.23 If sec α, tan α are roots of $ax^2 + bx + c = 0$, then
(a) $a^4 - b^4 + 4ab^2c = 0$ (b) $a^4 + b^4 - 4ab^2c = 0$
(c) $a^2 - b^2 = 4ac$ (d) $a^2 + b^2 = ac$

Q.24 If $0 < p < q < r$ and the roots α, β of the equation $px^2 + qx + r = 0$ are imaginary, then
(a) $|\alpha| = |\beta|$ (b) $|\alpha| < 1$ (c) $|\beta| < 1$ (d) $|\alpha| \neq |\beta|$

Q.25 Consider the equation $ax^2 + bx + c = 0$, where $a \neq 0, a, b, c \in R$ then
(a) If one root is $\alpha + \sqrt{\beta}$, then other root is $\alpha - \sqrt{\beta}$
(b) If $a = 1$ and b and c are integers, then root will be integer
(c) If one root is $\alpha + i\beta$, then other root will be $\alpha - i\beta$
(d) If roots are of opposite sign, then $b \neq 0$

Q.26 The sum of roots of $x^2 - 2x + 3 = 0$ i
(a) 1 (b) 2 (c) 3 (d) 4

Q.27 The product of roots of $x^2 + 10x + 11 = 0$ is
(a) 1 (b) 10 (c) 11 (d) –10

Q.28 One of the root of the equation $x^2 + x + 1 = 0$ is
(a) $-\frac{1}{2} + \frac{\sqrt{3}}{2}i$ (b) $\frac{1}{2} + \frac{\sqrt{3}}{2}i$ (c) $\frac{1}{2} - \frac{\sqrt{3}}{2}i$ (d) –1

Q.29 If 3 is root of $x^2 - kx + 3 = 0$ then k equals
(a) 1 (b) 2 (c) 3 (d) 4

Q.30 The least integral value of k for which the equation $x^2 - 2(k + 2)x + 12 + k^2 = 0$ has two distinct real roots.
(a) 0 (b) 2 (c) 3 (d) 4

Q.31 Let α and β are the roots of the equation $x^2 + x + 1 = 0$ then
(a) $\alpha^2 + \beta^2 = 4$ (b) $(\alpha - \beta)^2 = 3$ (c) $\alpha^3 + \beta^3 = 2$ (d) $\alpha^4 + \beta^4 = 1$

Q.32 The roots x_1 and x_2 of the equation $x^2 + px + 12 = 0$ are such that their difference is 1. Then the positive value of p is.
(a) 1 (b) 2 (c) 3 (d) 7

Q.33 If a and b are the non-zero roots of equation $x^2 + ax + b = 0$, then $(a + b)$ is equal to
(a) –1 (b) 2 (c) 1 (d) –2

Q.34 One of the root of quadratic equation with rational coefficient is $2 + \sqrt{3}$, then other root is.
(a) $2 + \sqrt{3}$ (b) $2 - \sqrt{3}$ (c) $-2 + \sqrt{3}$ (d) 1

Q.35 If both roots of $x^2 + 4x + k = 0$ are real and equal then k equals
(a) 2 (b) 4 (c) 8 (d) 16

Q.36 If the equation $(k^2 - 3k + 2)x^2 + (k^2 - 5k + 4)x + (k^2 - 6k + 5) = 0$ is an identity then the value of k is.
(a) 1 (b) 2 (c) 3 (d) 4

Q.37 The equation $\frac{a(x-b)(x-c)}{(a-b)(a-c)} + \frac{b(x-c)(x-a)}{(b-c)(b-a)} + \frac{c(x-a)(x-b)}{(c-a)(c-b)} = x$ is satisfied by.
(a) No value of x (b) Exactly two values of x
(c) Exactly three values of x (d) All values of x

Q.38 The number of roots of the equation $\sqrt{x-3}(x^2 - 7x + 10) = 0$ is
(a) 2 (b) 3 (c) 0 (d) 1

Q.39 The roots of the equation $x^3 - 2x^2 - x + 2 = 0$ are
(a) 1,2,3 (b) $-1,1,2$ (c) $-1,0,1$ (d) $-1,-2,3$

Q.40 If 1,2,3 are the roots of the equation $x^3 + ax^2 + bx + c = 0$, then
(a) $a = 1, b = 2, c = 3$ (b) $a = -6, b = 11, c = -6$
(c) $a = 6, b = 11, c = 6$ (d) $a = 6, b = 6, c = 6$

Q.41 If the ratio of the roots of $Ix^2 - nx + n = 0$ is p: q, then
(a) $\sqrt{\frac{p}{q}} + \sqrt{\frac{q}{p}} + \sqrt{\frac{n}{l}} = 0$ (b) $\sqrt{\frac{p}{q}} + \sqrt{\frac{q}{p}} - \sqrt{\frac{n}{l}} = 0$
(c) $\sqrt{\frac{q}{p}} + \sqrt{\frac{p}{q}} + \sqrt{\frac{l}{n}} = 1$ (d) $\sqrt{\frac{q}{p}} + \sqrt{\frac{p}{q}} + \sqrt{\frac{l}{n}} = 0$

Q.42 If $a + b + c = 0$ and a, b, c are rational, then the roots of the equation
$(b + c - a)x^2 + (c + a - b)x + (a + b - c) = 0$ are
(a) Rational (b) Irrational (c) Imaginary (d) Equal

Q.43 If the equation $x^2 + px + p = 0, p \in I$ has both the roots integer then $(p^2 - 4p)$ can attain.
(a) No integral value (b) One integral value
(c) Two integral values (d) Three integral values

Q.44 If a, b are real and unequal, then the roots of the quadratic equation $(a - b)x^2 - 5(a + b)x - 2(a - b) = 0$ are.
(a) Real and equal (b) Non-real complex
(c) Real and unequal (d) None of these

Q.45 Let α and β be the real roots of the equation $x^2 - x(\lambda - 2) + (\lambda^2 + 3\lambda + 5) = 0$. The maximum value of $\alpha^2 + \beta^2$ is.
(a) 18 (b) 20 (c) 27 (d) 19

Q.46 If $a, b, c \in R$ and the equations $ax^2 + bx + c = 0$ and $x^2 + x + 1 = 0$ have a common root then a: b: c is equal to.
(a) 1: 1: 1 (b) 1: 2: 3 (c) 2: 3: 1 (d) 3: 2: 1

Q.47 $(\alpha_1, \alpha_2), (\alpha_2, \alpha_3)$ and (α_3, α_1) are respectively the roots of $x^2 - 2ax + 2 = 0, x^2 - 2bx + 3 = 0$ and $x^2 - 2cx + 6 = 0$. If $\alpha_1, \alpha_2, \alpha_3 \in R^+$, then the value of $a + b + c$ is equal to
(a) 2 (b) 3 (c) 6 (d) 12

Q.48 If the minimum value of $x^2 + 2x + 3$ is m and maximum value of $-x^2 + 4x + 6$ is M then the value of $m + M$ is
(a) 10 (b) 11 (c) 12 (d) 13

Q.49 For all $x \in R$ if $mx^2 - 9mx + 5m + 1 > 0$, then m lies in the interval
(a) $(-\frac{61}{4}, 0)$ (b) $(\frac{4}{61}, \frac{61}{4})$ (c) $[0, \frac{4}{61})$ (d) $(\frac{-4}{61}, 0)$

Q.50 For the equation $|x^2| + |x| - 6 = 0$, the roots are
(a) Real and equal (b) Real with sum 0
(c) Real with sum 1 (d) Real with product 0

Q.51 If $p + iq$ be one of the roots of the equation$x^3 + ax + b = 0$ then$2p$ is one of the roots of the equation.
(a) $x^3 + ax + b = 0$ (b) $x^3 - ax - b = 0$
(c) $x^3 + ax - b = 0$ (d) $x^3 + bx + a = 0$

Q.52 If α, β are roots of $ax^2 + bx + c = 0$, then the equation $ax^2 - bx(x-1) + c(x-1)^2 = 0$
(a) $\frac{\alpha}{1-\alpha}, \frac{\beta}{1-\beta}$ (b) $\frac{1-\alpha}{\alpha}, \frac{1-\beta}{\beta}$ (c) $\frac{\alpha}{1+\alpha}, \frac{\beta}{1+\beta}$ (d) $\frac{1+\alpha}{\alpha}, \frac{1+\beta}{\beta}$

Q.53 Let α and β be two roots of the equation$x^2 + 2x + 2 = 0$, then $\alpha^{15} + \beta^{15}$ is equal to
(a) –512 (b) 512 (c) 256 (d) –256

Q.54 If both the roots of the quadratic equation, $x^2 - mx + 4 = 0$ are real and distinct and they lie in the interval [1,5] then k lies in the interval.
(a) $(-5, -4)$ (b) (3,4) (c) (4,5) (d) (5,6)

Q.55 The number of all positive integer value of a for which the roots of the quadratic equation $6x^2 - 11x + \alpha = 0$ are rational number is.
(a) (b) (c) (d)

Q.56 Consider the quadratic equation $(c-5)x^2 - 2cx + (c-4) = 0, c \neq 5$ let S be the set of all integral value of c for which one root of the equation les in the interval (0, 2) and its other root lies in the interval (2, 3). Then the number of element in S is.
(a) 11 (b) 18 (c) 12 (d) 10

Q.57 The value of λ such that sum of the square of the roots of the quadratic equation $x^2 + (3-\lambda)x + 2 = \lambda$ has the least value is.
(a) 2 (b) 1 (c) $\frac{15}{8}$ (d) $\frac{4}{9}$

Q.58 If one real root of the quadratic equation $81x^2 + kx + 256 = 0$is cube of the other root, then a value of k is
(a) –300 (b) 144 (c) –81 (d) 100

Q.59 Let α and β the roots of the quadratic equation, $x^2 \sin\theta - x(\sin\theta\cos\theta + 1) + \cos\theta = 0 (0 < \theta < 45°)$, and $\alpha < \beta$. Then $\sum_{n=0}^{\infty}(\alpha^n + \frac{(-1)^n}{\beta^n})$ is equal to
(a) $\frac{1}{1+\cos\theta} - \frac{1}{1-\sin\theta}$ (b) $\frac{1}{1-\cos\theta} + \frac{1}{1+\sin\theta}$ (c) $\frac{1}{1-\cos\theta} - \frac{1}{1+\sin\theta}$ (d) $\frac{1}{1+\cos\theta} + \frac{1}{1-\sin\theta}$

Q.60 If λ be the ration of the roots of the quadratic equation in x, $3m^2x^2 + m(m-4)x + 2 = 0$, then the least value of m for which $\lambda + \frac{1}{\lambda} = 1$, is
(a) $4 - 2\sqrt{3}$ (b) $4 - 3\sqrt{2}$ (c) $2 - \sqrt{3}$ (d) $-2 + \sqrt{2}$

EXERCISE LEVEL –II

EL– II

Q.1 If α and β are the roots of the equation $x^2 - 7x + 1 = 0$, then determine the value of. $\frac{1}{(\alpha-7)^2} + \frac{1}{(\beta-7)^2}$

Q.2 Determine the sum of all real roots of the equation $(x - 2)^2 + |x - 2| - 2 = 0$.

Q.3 If a and b ($\neq 0$) are the roots of the equation $x^2 + ax + b = 0$, determine the minimum value of $x^2 + ax + b$ for $x \in R$.

Q.4 If α is a real root of the equation $2x^3 - 3x^2 + 6x + 6 = 0$, determine $[\alpha]$, where $[\cdot]$ represents the greatest integer function.

Q.5 Create the cubic equation with roots three times each of the roots of $x^3 + 2x^2 - 4x + 1 = 0$.

Q.6 $(x - 3)(x + 2) = 0$ then find the value of x.

Q.7 . If α, β are the roots of the equation $x^2 + 5x - 7 = 0$ then find the value of $\frac{\alpha+\beta}{\alpha\beta}$.

Q.8 Write the number of real roots of the equation, $(x + 2)^2 + (x - 3)^2 + (x - 4)^2 = 0$.

Q.9 If $2 + \sqrt{3}$ is a root of the equation, $x^2 + px + q = 0$, then write the value of p and q.

Q.10 If a and b are roots of the equation, $x^2 - x + 1 = 0$, then write the value of $a^2 + b^2$.

Q.11 Solve the quadratic equation, $25x^2 - 30x + 11 = 0$.

Q.12 For the equation, $|x|^2 + |x| - 6 = 0$, find the sum of real roots.

Q.13 Find the values of k for which the quadratic equation, $x^2 - kx + k + 2 = 0$ has equal roots.

Q.14 Solve the quadratic equation, $x^2 - \left(3\sqrt{2} - 2i\right)x - 6\sqrt{2}i = 0, x \in C$.

Q.15 Solve the quadratic equation, $2x^2 - (3 + 7i)x - (3 - 9i) = 0, x \in C$.

ANSWER KEY – LEVEL – I

Q.	1	2	3	4	5	6	7	8	9	10
Ans.	b	a	b	b	b	a	b	a	b	b
Q.	11	12	13	14	15	16	17	18	19	20
Ans.	c	b	a	b	a	c	d	c	d	b
Q.	21	22	23	24	25	26	27	28	29	30
Ans.	b	d	a	a	c	b	c	a	d	c
Q.	31	32	33	34	35	36	37	38	39	40
Ans.	c	d	a	b	b	a	d	a	b	b
Q.	41	42	43	44	45	46	47	48	49	50
Ans.	b	a	b	c	a	a	c	c	c	b
Q.	51	52	53	54	55	56	57	58	59	60
Ans.	c	c	d	c	d	a	a	a	b	b

ANSWER KEY – LEVEL – II

1. 47
2. 4
3. $-\frac{9}{4}$
4. -1
5. $x^3 + 6x^2 - 36x + 27 = 0$