Dear student following is an Easy level [●○○] test paper. Score of 24 Marks in 15 Minutes would be a satisfactory performance. Questions 1-10(+3,–1). (All questions have only one option correct).

Q.1 If a + b + c = 0 and a, b, c are rational numbers, then the roots of the equation $(b + c - a) x^2 + (c + a - b)x + (a + b - c) = 0$

(A) Rational (B) Irrational
(C) Non real (D) None of these

Q.2 If $a \in I$ and the equation $(x - a)(x - 10) + 1 = 0$ has integral roots, then the values of a are-

(A) 10, 8 (B) 12, 10
(C) 12, 8 (D) None of these

Q.3 The two non-integer roots of the equation $(x^2 + 3x)^2 - (x^2 + 3x) - 6 = 0$ is-

(A) $\frac{1}{2}\left(-3+\sqrt{11}\right), \frac{1}{2}\left(-3-\sqrt{11}\right)$

(B) $\frac{1}{2}\left(-3+\sqrt{7}\right), \frac{1}{2}\left(-3-\sqrt{7}\right)$

(C) $\frac{1}{2}\left(-3+\sqrt{21}\right), \frac{1}{2}\left(-3-\sqrt{21}\right)$

(D) None of these

Q.4 The number of real solutions of $\frac{1}{x+1} + \frac{1}{x+5} = \frac{1}{x+2} + \frac{1}{x+4}$ is-

(A) 0 (B) 1 (C) 2 (D) 3

Q.5 The number of solution of $\sqrt{3x^2 + x + 5} = x - 3$ is-

(A) 0 (B) 1 (C) 2 (D) 4

Q.6 If $f(x) = x^2 + 2bx + 2c^2$ and $g(x) = -x^2 - 2cx + b^2$ are such that min f(x) > max g(x), then relation between b and c is-

(A) No relation (B) $0 < c < \frac{b}{2}$

(C) $|c| < \frac{|b|}{\sqrt{2}}$ (D) $|c| > \sqrt{2}\,|b|$

Q.7 Let α, β be the roots of the equation $(x - a)(x - b) = c$ with $c \neq 0$. Then the roots of the equation $(x - \alpha)(x - \beta) + c = 0$ are-

(A) a, c (B) b, c
(C) a, b (D) a + c, b + c

Q.8 If p, q are roots of $x^2 + px + q = 0$, then

(A) p = 1 (B) p = 1 or 0
(C) p = – 2 (D) p = – 2 or 0

Q.9 The number of real roots of $(x + 3)^4 + (x + 5)^4 = 16$ is-

(A) 0 (B) 2
(C) 4 (D) None of these

Q.10 If ℓ, m, n are real, $\ell + m \neq 0$, then the roots of the equation $(\ell + m) x^2 - 3(\ell - m) x - 2(\ell + m) = 0$ are-

(A) Real and equal (B) Complex
(C) Real and unequal (D) None of these

MATHEMATICS IIT JEE (JULY 3rd WEEK CLASS TEST 3) (QUADRATIC EQUATION) ANSWER KEY

Name : .... Roll No. : ....

	A	B	C	D		A	B	C	D		A	B	C	D
1	○	○	○	○	4	○	○	○	○	7	○	○	○	○
2	○	○	○	○	5	○	○	○	○	8	○	○	○	○
3	○	○	○	○	6	○	○	○	○	9	○	○	○	○
										10	○	○	○	○

ANSWER KEY

Que.	1	2	3	4	5	6	7	8	9	10
Ans.	A	C	C	B	A	D	C	B	B	C

SOLUTIONS

Sol.1 (A)

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

$\Rightarrow D = (c + a - b)^2 - 4(b + c - a)(a + b - c)$

$= (-2b)^2 - 4(-2a)(-2c)$

$= 4b^2 - 16ac$

$= 4(a + c)^2 - 16ac \quad \because a + b + c = 0$

$= 4[(a - c)^2]$

$\Rightarrow$ D is a perfect square. Hence roots of the equation are rational number.

Sol.2 (C)

Since a and x are integers

$\Rightarrow$ $(x - a)$ and $(x - 10)$ are also integers

$\therefore$ $(x - a)(x - 10) + 1 = 0$

$\Rightarrow$ $(x - a)(x - 10) = -1$

which is possible if one of the factor is 1 and other is -1.

$\therefore$ either $(x - a) = 1$ and $(x - 10) = -1$

or $(x - a) = -1$ and $(x - 10) = 1$

$\Rightarrow$ $x = 1 + a$ and $x = 9$

or $x = -1 + a$ and $x = 11$

$\Rightarrow$ $a = 8$ or 12

Sol.3 (C)

Given $(x^2 + 3x)^2 - (x^2 + 3x) - 6 = 0$

Let $x^2 + 3x = y$

$\Rightarrow$ $y^2 - y - 6 = 0$

$\Rightarrow$ $(y + 2)(y - 3) = 0$

$\Rightarrow$ $y = -2, +3$

When $y = -2$

$x^2 + 3x = -2$

$\Rightarrow$ $(x + 1)(x + 2) = 0$

$\Rightarrow$ $x = -1, -2$

When $y = 3$

$x^2 + 3x = 3$

$\Rightarrow$ $x^2 + 3x - 3 = 0$

$$\Rightarrow x = \frac{-3 \pm \sqrt{9 + 12}}{2} = \frac{-3 \pm \sqrt{21}}{2}$$

Sol.4 (B)

$$\frac{1}{x+1} + \frac{1}{x+5} = \frac{1}{x+2} + \frac{1}{x+4}$$

$$\Rightarrow \frac{1}{x+1} - \frac{1}{x+2} = \frac{1}{x+4} - \frac{1}{x+5}$$

$$\Rightarrow \frac{x+2-x-1}{x^2+3x+2} = \frac{x+5-x-4}{x^2+9x+20}$$

$$\Rightarrow \frac{1}{x^2+3x+2} = \frac{1}{x^2+9x+20}$$

$$\Rightarrow \frac{1}{x^2+3x+2} = \frac{1}{x^2+9x+20}$$

$\Rightarrow$ $x^2 + 9x + 20 = x^2 + 3x + 2$

$\Rightarrow$ $6x = -18$

$\Rightarrow$ $x = -3$

Sol.5 (A)

Note that we must have $3x^2 + x + 5 \geq 0$ and $x - 3 \geq 0$ i.e. $x \geq 3$

Now squaring both sides of given equation we have

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

$\Rightarrow$ $2x^2 + 7x - 4 = 0$

$\Rightarrow$ $(2x - 1)(x + 4) = 0$

$\Rightarrow$ $x = \frac{1}{2}, -4$

$\because$ $x \geq 3$

$\Rightarrow$ No value of x satisfy the relation

$\Rightarrow$ given equation has no solution

Sol.6 (D)

$f(x) = x^2 + 2bx + 2c^2$

$f(x) = (x + b)^2 + 2c^2 - b^2$

$\Rightarrow$ $\min f(x) = 2c^2 - b^2$

and $g(x) = -x^2 - 2cx + b^2$

$g(x) = -(x + c)^2 + b^2 + c^2$

$\Rightarrow$ $\max. g(x) = b^2 + c^2$

$\because$ $\min. f(x) > \max. g(x)$

$\Rightarrow$ $2c^2 - b^2 > b^2 + c^2$

$\Rightarrow$ $c^2 > 2b^2 \quad \Rightarrow \quad |c| > \sqrt{2}\,|b|$

Sol.7 (C)

Given α, β are roots of $(x - a)(x - b) = c$

$\Rightarrow$ $\alpha + \beta = a + b$ and $\alpha\beta = ab - c$

or $a + b = \alpha + \beta$ and $ab = \alpha\beta + c$

$\Rightarrow$ a, b are roots of the equation

$(x - \alpha)(x - \beta) + c = 0$

Sol.8 (B)

Given p, q are roots of $x^2 + px + q = 0$

$\Rightarrow$ $p + q = -p$ and $pq = q$

$\Rightarrow$ $2p = -q$ and $p = 1$ or $q = 0$

$\therefore$ If $p = 1$, $q = -2$

If $q = 0$, $p = 0$

Thus $p = 0, 1$

Sol.9 (B)

Put $y = x + \frac{3+5}{2} = x + 4$

The given equation becomes

$(y - 1)^4 + (y + 1)^4 = 16$

$\Rightarrow$ $2\{y^4 + 6y^2 + 1\} = 16$

$\Rightarrow$ $y^4 + 6y^2 - 7 = 0$

$\Rightarrow$ $(y^2 + 7)(y^2 - 1) = 0$

$\Rightarrow$ $y^2 = -7$ or $y^2 = 1$

$\Rightarrow$ $y = \pm\sqrt{7}\,i$ or $y = \pm 1$

$\Rightarrow$ $x = -4 \pm \sqrt{7}\,i$ or $x = -4 \pm 1 = -5$ or -3

Thus, the given equation has two real roots.

Sol.10 (C)

Discriminant of the given equation is

$D = 9(\ell - m)^2 + 8(\ell + m)^2$

As $\ell + m \neq 0$, $(\ell + m)^2 > 0$.

Also $(\ell - m)^2 \geq 0$.

Thus, $D > 0$.

Hence, roots are real and unequal.