SHIKSHA CLASSES

Subject : Algebra | **ANSWERS PAPER** | **Total Marks** : 20

Class : X | **2. Quadratic Equations**

Q. 1 : a) Choose the correct alternative of the following. (2)

1) General form of the quadratic equation is.

Ans. : c) $ax^2 + bx + c = 0$

2) In a quadratic Equation if

$b^2 - 4ac < 0$ **then roots are**

Ans. : b) Not real

Q. 1 B) Write the following equation in its standard form. (1)

$2y = 10 - y^2$

Ans. : $2y = 10 - y^2$

$\therefore\ y^2 + 2y - 10 = 0$

Q. 2 : A) Solve Any ONE of the following. (2)

1) Find the value of discriminant.

$\sqrt{2}\,x^2 + 4x + 2\sqrt{2} = 0$

Ans. : $\sqrt{2}\,x^2 + 4x + 2\sqrt{2} = 0$

comparing with $ax^2 + bx + c = 0$,

We get $\therefore\ a = \boxed{\sqrt{2}},\ \ b = \boxed{4},\ \ c = \boxed{2\sqrt{2}}$

$\Delta = \boxed{b^2 - 4ac}$

$= (4)^2 - 4 \times \sqrt{2} \times 2\sqrt{2}$

$= 16 - 4 \times 2 \times \sqrt{2 \times 2}$

$= 16 - 4 \times 2 \times 2$

$= 16 - 16 = \boxed{0}$

2) Solve by formula method.

$x^2 + 6x + 5 = 0$

Ans. : $x^2 + 6x + 5 = 0$

Comparing with $ax^2 + bx + c = 0$

$\therefore\ a = 1,\ b = 6\ \ c = 5$

$$\therefore\ x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$= \frac{-6 \pm \sqrt{(6)^2 - 4 \times 1 \times 5}}{2 \times 1}$$

$$= \frac{-6 \pm \sqrt{36 - 20}}{2}$$

$$= \frac{-6 \pm \sqrt{16}}{2}$$

$$= \frac{-6 \pm 4}{2} = \frac{\cancel{2}(-3 \pm 2)}{\cancel{2}}$$

$x = -3 \pm 2 = -3 + 2 = -1$ Or

$x = -3 - 2 = -5$

$\therefore x = -1$ or $x = -5$

Q. 2 : B) Solve Any ONE of the following. (2)

1) Write the following quadratic equation in standard form.

$$3m^2 = 2m^2 - 9$$
$$x^2 - 9 = 13.$$

Ans. : $3m^2 = 2m^2 - 9$

$= 3m^2 - 2m^2 + 9 = 0$

$= m^2 + 9 = 0$

$x^2 - 9 = 13$

$x^2 = 13 + 9$

$x^2 = 22$

$x^2 - 22 = 0$

2) Factorise $m^2 - 14m + 13 = 0$.

Ans. : $m^2 - 14m + 13 = 0$

$m^2 - 13m - m + 13 = 0$

$m(m - 13) - 1(m - 13) = 0$

$(m - 13)(m - 1) = 0$

$\therefore$ $m = 13$ or $m = 1$.

Q.3 : A) Solve Any ONE of the following. (3)

1) Form the quadratic equation from the roots given below.

$$2 - \sqrt{5}, \quad 2 + \sqrt{5}$$

Ans. : Consider $\alpha = 2 - \sqrt{5}$

$\beta = 2 + \sqrt{5}$

But we know that,

$x^2 - (\alpha + \beta)x + \alpha\beta = 0$ _______ (1)

$\therefore \alpha + \beta = (2 - \sqrt{5}) + (2 + \sqrt{5})$

$= 2 - \cancel{\sqrt{5}} + 2 + \cancel{\sqrt{5}}$

$= 2 + 2 = 4$

$\therefore \quad \alpha + \beta = 4$

$\alpha \times \beta = (2 - \sqrt{5}) \times (2 + \sqrt{5})$

$= (2)^2 - (\cancel{\sqrt{5}})^{\cancel{2}}$

$= 4 - 5 = -1$

$\therefore \alpha \times \beta = -1$

$\therefore$ Put the values of $\alpha + \beta$ and $\alpha \times \beta$ in eq^n (1)

$\therefore x^2 - (\alpha + \beta)x + \alpha\beta = 0$

$x^2 - 4x - 1 = 0$

$\therefore$ Required quadratic eq^n is

$x^2 - 4x - 1 = 0$

2) If α and β are roots of $y^2 - 2y - 7 = 0$ then find 1) $\alpha^2 + \beta^2$ 2) $\alpha^3 + \beta^3$

Ans. : $y^2 - 2y - 7 = 0$

Comparing with $ax^2 + bx + c = 0$

$a = \boxed{1}, \quad b = \boxed{-2}, \quad c = \boxed{-7}$

$\therefore \alpha + \beta = \dfrac{\boxed{-b}}{\boxed{a}} = \dfrac{\boxed{-(-2)}}{\boxed{1}} = \dfrac{2}{1}$

$\therefore \alpha \times \beta = \dfrac{\boxed{c}}{\boxed{a}} = \dfrac{\boxed{-7}}{\boxed{1}} = -7$

1) $\alpha^2 + \beta^2 = \boxed{(\alpha + \beta)^2} - 2\alpha\beta$

$= (2)^2 - 2 \times (-7)$

$= 4 + 14 = 18$

$\therefore \alpha^2 + \beta^2 = 18$

2) $\alpha^3 + \beta^3 = \boxed{(\alpha + \beta)^3} - 3\alpha\beta(\alpha + \beta)$

$= (2)^3 - 3(-7)(2)$

$= 8 + 42$

$\alpha^3 + \beta^3 = 50$

Q. 3 : B) Solve Any ONE of the following. (3)

1) The sum of the squares of two consecutive even natural numbers is 100 then find the numbers.

Ans. : Let the two consecutive even natural numbers be *x* and *x + 2*

$\therefore$ By given condition.

$x^2 + (x + 2)^2 = 100$

$x^2 + x^2 + 4x + 4 = 100$

$2x^2 + 4x + 4 - 100 = 0$

$\therefore 2x^2 + 4x - 96 = 0$

$\therefore$ Divide by 2

$\therefore x^2 + 2x - 48 = 0$

$$\therefore x^2 + 8x - 6x - 48 = 0$$

$$\therefore x(x+8) - 6(x+8) = 0$$

$$(x+8)\,(x-6) = 0$$

$$\therefore (x+8) = 0 \text{ or } (x-6) = 0$$

$$x = -8 \text{ or } x = 6$$

$\therefore$ But - 8 is not a natural no.

$$\therefore x = 6$$

$$\therefore x + 2 = 6 + 2 = 8$$

$\therefore$ The required numbers are 6 and 8

2) Solve quadratic equation by using formula method.

$m^2 - 14m + 13 = 0$

Ans. : $m^2 - 14m + 13 = 0$

comparing with $ax^2 + bx + c = 0$

we get a = 1, b = – 14,, c = 13

$$\therefore b^2 - 4ac = (-14)^2 - 4 \times 1 \times 13$$

$$= 196 - 52$$

$$= 144$$

$$m = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$= -\frac{(-14) \pm \sqrt{144}}{2 \times 1}$$

$$= \frac{14 \pm 12}{2}$$

$$\therefore \quad m = \frac{14+12}{2} \text{ or } m = \frac{14-12}{2}$$

$$\therefore \quad m = \frac{26}{2} \text{ or } m = \frac{3}{2}$$

$\therefore$ m = 13 or m = 1

$\therefore$ 13 and 1 are roots of equation.

Q. 4 : Attempt any ONE of the following. (4)

1) Solve by completing square method

$$5x^2 - 4x - 3 = 0$$

Ans. : $5x^2 - 4x - 3 = 0$

Divide by 5,

$$\frac{\cancel{5}x^2}{\cancel{5}} - \frac{4x}{5} - \frac{3}{5} = 0$$

$$\therefore x^2 - \frac{4}{5}x - \frac{3}{5} = 0$$

If $x^2 - \frac{4}{5}x + k = (x-a)^2$

then $x^2 - \frac{4}{5}x + k = x^2 - 2ax + a^2$

Comparing the terms $x^2 - \frac{4}{5}x$ and $x^2 - 2ax$

$$\therefore -2a\cancel{x} = -\frac{4}{5}\cancel{x}$$

$$+2a = +\frac{4}{5}$$

$$a = \frac{\cancel{4}^{2}}{5} \times \frac{1}{\cancel{2}_{1}} = 2/5$$

and $k = a^2 = \left(\frac{2}{5}\right)^2 = \frac{4}{25}$

Now, $x^2 - \frac{4}{5}x - \frac{3}{5} = 0$

$$\therefore x^2 - \frac{4}{5}x + \frac{4}{25} - \frac{4}{25} - \frac{3}{5} = 0$$

$$\therefore \left(x - \frac{2}{5}\right)^2 - \frac{4}{25} - \frac{3}{5} = 0$$

$$\therefore \left(x - \frac{2}{5}\right)^2 - \left(\frac{4}{25} + \frac{3}{5}\right) = 0$$

$$\therefore \left(x - \frac{2}{5}\right)^2 - \left(\frac{19}{25}\right) = 0$$

$$\therefore \left(x - \frac{2}{5}\right)^2 = \left(\frac{19}{25}\right)$$

Taking square root on both sides,

$$\therefore \left(x - \frac{2}{5}\right) = \pm\frac{\sqrt{19}}{5}$$

$$\therefore \left(x - \frac{2}{5}\right) = \frac{\sqrt{19}}{5} \text{ or } \left(x - \frac{2}{5}\right) = \frac{-\sqrt{19}}{5}$$

$$\therefore x = \frac{2+\sqrt{19}}{5} \text{ or } x = \frac{2-\sqrt{19}}{5}$$

$\therefore \dfrac{2+\sqrt{19}}{5}$ and $\dfrac{2-\sqrt{19}}{5}$ are the roots of given eq^n

2) A natural number is grater than three times its square root by 4. Find the number.

Ans. : Let the natural No. be x

$\therefore$ It's square root is $\sqrt{x}$

$\therefore$ By given condition.

$$x = 3\sqrt{x} + 4$$

$$x - 4 = 3\sqrt{x}$$

$\therefore$ Squaring on both sides

$$\therefore (x-4)^2 = \left(3\sqrt{x}\right)^2$$

$$\therefore x^2 - 8x + 16 = \left(3^2 x\right)$$

$$\therefore x^2 - 8x + 16 = 9x$$

$$\therefore x^2 - 8x - 9x + 16 = 0$$

$$\therefore x^2 - 17x + 16 = 0$$

$$x^2 - x - 16x + 16 = 0$$

$$x(x-1) - 16(x-1) = 0 \text{ s}$$

$$(x-1)(x-16) = 0$$

$$x = 1 \text{ or } x = 16$$

Now, if $x = 1$ then square root is 1

$\therefore$ 1 cannot be grater than three times its square root by 4

$$\therefore x \neq 1 \quad \therefore x = 16$$

$\therefore$ The required natural number is 16.

Q. 5 : Solve Any ONE of the following. (3)

1) The difference between the roots of equation $x^2 - 13x + k = 0$ is 7. Find k.

Ans.: Comparing $x^2 - 13x + k = 0$ with $ax^2 + bx + c = 0$

$$a = 1, b = -13, c = k$$

Let α & β roots at the equation.

$$\alpha + \beta = \frac{-b}{a} = -\frac{(-13)}{1} = 13 \qquad ---(i)$$

But $\alpha - \beta = 7$, ---- (given) (ii)

$2\alpha = 20$ ----(Adding (i) & (ii))

$$\therefore \alpha = 10$$

$10 + \beta = 13$ ---- (from i)

$$\therefore \beta = 13 - 10$$

$$\therefore \beta = 3$$

But $\alpha\beta = \dfrac{c}{a}$

$$\therefore 10 \times 3 = \frac{k}{1}$$

$$\therefore k = 30.$$

2) Solve by factorization method.

$$6\sqrt{3}x^2 + 7x = \sqrt{3}$$

Ans. : $6\sqrt{3}x^2 + 7x = \sqrt{3}$

$$6\sqrt{3} \times \sqrt{3} = 18$$
$$9 - 2 = 7$$

$$\therefore 6\sqrt{3}x^2 + 7x - \sqrt{3} = 0$$

$$\therefore 6\sqrt{3}x^2 + 9x - 2x - \sqrt{3} = 0$$

$$3\sqrt{3}x\left(2x + \sqrt{3}\right) - 1\left(2x + \sqrt{3}\right) = 0$$

$$\therefore \left(2x + \sqrt{3}\right)\left(3\sqrt{3}x - 1\right) = 0$$

$$\therefore \left(2x + \sqrt{3}\right) = 0 \text{ or } 3\sqrt{3}x - 1 = 0$$

$$\therefore 2x = -\sqrt{3} \text{ or } 3\sqrt{3}x = 1$$

$$\therefore x = -\sqrt{3}/2 \text{ or } x = 1/3\sqrt{3}$$

$\therefore -\dfrac{\sqrt{3}}{2}$ and $\dfrac{1}{3\sqrt{3}}$ are the roots of quadratic equation

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