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## Answers Key:

**5 Marks**

1. Given equations is $x^2 - 3x - 10 = 0$
   $\Rightarrow x^2 - 5x + 2x - 10 = 0$
   $[\because -5x(2) = -10 and -5 + 2 = -3]$
   $\Rightarrow x(x-5) + 2(x-5) = 0$
   $\Rightarrow x - 5 = 0 \quad \Rightarrow x = 5$
   $\Rightarrow x + 2 = 0 \Rightarrow x = -2$
   Hence, the roots of the equation
   $x^2 - 3x - 10 = 0 \quad are - 2 \quad and \quad 5$
2. Given equation is $2x^2 + x + 4 = 0$
   On dividing both sides by 2,we get
   $x^2 + \frac{1}{2}x + 2 = 0 \Rightarrow x^2 + \frac{1}{2}x = -2$
   On adding $\left[\frac{1}{2} coefficent of x\right]^2$
   i.e. $\left[\frac{1}{2}x\frac{1}{2}\right]^2 = \frac{1}{16}$ both sides,we get
   $x^2 + \frac{1}{2}x + \frac{1}{16} = -2 + \frac{1}{16}$
   $\Rightarrow \left(x + \frac{1}{4}\right)^2 = -\left(\frac{\sqrt{31}}{4}\right)^2$
   Which is not possible as the square of a real number cannot be negative. Therefore, the real roots of the equation $2x^2 + x + 4 = 0$ do not exist.

**3 Marks**

3. Given quadratic equation is $2x^2-6x+a=0$
   $\alpha, \beta$ are roots of the equation
   $\alpha + \beta = \frac{-b}{a} \Rightarrow \alpha + \beta = -\frac{-6}{2} \Rightarrow \alpha + \beta = 3 \Rightarrow \alpha = 3 - \beta$..... (i)
   Also $2\alpha + 5\beta = 12$
   $\Rightarrow 2(3 - \beta) + 5 = 12$
   $\Rightarrow 6 - 2\beta + 5\beta = 12 \Rightarrow 3\beta = 6 \Rightarrow \beta = 2$
   where $\beta = 2$, eq.(i) becomes $\alpha = 3 - 2 = 1$
   Now,product of roots = $\frac{c}{a}$
   $\Rightarrow \alpha.\beta = \frac{a}{2} \Rightarrow 1 \times 2 = \frac{a}{2} \Rightarrow a = 4$
4. Let $\alpha$ and $\beta$ re the roots of the equation $x^2-7x+2k=0$
   $\Rightarrow \alpha + \beta = \left(\frac{-7}{1}\right) = 7$ ....(i)
   and $\alpha\beta = 2k$ ....(ii)
   ATQ $\alpha - \beta = 1 \Rightarrow (\alpha - \beta)^2 = 1$
   $\Rightarrow (\alpha + \beta)^2 = 1$ [using $(a-b)^2 = (a+b)^2-4ab$]
   $\Rightarrow (7)^2 - 4 \times 2k = 1$ [using (i) and (ii)]
   $\Rightarrow 49 - 8k = 1 \Rightarrow -8k = -48 \Rightarrow k = 6$
5. The equation has real roots if $D \geq 0$
   $(4)^2 - 4p \geq 0$
   i.e., $16 - 4p \geq 0 \; or \; 16 \geq 4p \; or \; p \leq 4$
6. $Kx^2+1-2(k-4 1)x+x^2=0$
   $\Rightarrow kx^2 + x^2 - 2(k-1)x + 1 = 0$
   $\Rightarrow (k+1)x^2 - 2(k-1)x + 1 = 0$
   Here,a=k +1 ,b=-2(k-1),c=1
   $D=b^2-4ac$
   $=[-2(k-1)^2--4(k+1)(1)$
   $=4(k-1)^2-4(k+1)$
   Roots are equal
   D=0
   $\Rightarrow 4(k-1)^2 - 4(k+1) = 0$
   $\Rightarrow 4(k-1)^2 - (k+1) = 0$
   $\Rightarrow (k-1)^2 - k - 1 = 0$
   $\Rightarrow k^2 + 1 - 2k - k - 1 = 0$
   $\Rightarrow k^2 - 3k = 0$
   $\Rightarrow k(k-3) = 0$
   k=0 or k-3=0 $\Rightarrow k = 3$
   Non zero value of k =3
   after putting the value of k=3 in equation we get
   $3x3^2+1-2(3-1)x+x^2 =0$
   $\Rightarrow 3x^2 + 1 - 2(2)x + x^2 = 0$
   $\Rightarrow 3x^2 + 1 - 4x + x^2 = 0$
   $\Rightarrow 4x^2 - 4x + 1 = 0$

$\Rightarrow 4x^2 - 2x - 2x + 1 = 0$
$\Rightarrow 2x(2x-1) - 1(2x-1) = 0$
$\Rightarrow (2x-1) \quad (2x-1) = 0$
2x-1=0 or 2x-1=0
2x-1 or 2x=1
$x = \frac{1}{2}$ or $x = \frac{1}{2}$
Roots are $x = \frac{1}{2}, \frac{1}{2}$

7. ATQ (60-t) = $\frac{t^2}{4} - 3$
$\Rightarrow 240 - 4t = t^2 - 12$
$\Rightarrow t^2 + 4t - 252 = 0$
$\Rightarrow t^2 + 18t - 14t - 252 = 0$
$\Rightarrow (t+18)(t-14) = 0$
$\Rightarrow$ t=14,-18 [rejected]
$\Rightarrow$ t=14 minutes

8. $3x^2 - 2\sqrt{6}x + 2 = 3x^2 - \sqrt{6}x - \sqrt{6}x + 2$
$= \sqrt{3}x(\sqrt{3}x - \sqrt{2}) - \sqrt{2}(\sqrt{3}x - \sqrt{2})$
$= (\sqrt{3}x - \sqrt{2})(\sqrt{3}x - \sqrt{2})$
So, the roots of the equation are the values of x for which
$(\sqrt{3}x - \sqrt{2})(\sqrt{3}x - \sqrt{2}) = 0$
Now, $\sqrt{3}x - \sqrt{2} = 0$ for $x = \sqrt{\frac{2}{3}}$
So, this root is repeated twice, one for each repeated factor $\sqrt{3}x - \sqrt{2}$
Therefore, the roots of $3x^2 - 2\sqrt{6}x + 2 = 0$ are $\sqrt{\frac{2}{3}}, \sqrt{\frac{2}{3}}$

9. $\frac{1}{(x-1)(x-2)} + \frac{1}{(x-2)(x-3)} = \frac{2}{3}$
$\Rightarrow \frac{x-3+x-1}{(x-1)(x-2)(x-3)} = \frac{2}{3}$
$\Rightarrow \frac{2x-4}{(x-1)(x-2)(x-3)} = \frac{2}{3}$
$\Rightarrow \frac{2(x-2)}{(x-1)(x-2)(x-3)} = \frac{2}{3}$
$\Rightarrow \frac{2}{(x-1)(x-3)} = \frac{2}{3}$
$\Rightarrow 3 = (x-1)(x-3) \Rightarrow x^2 - 4x + 3 = 3 \Rightarrow x^2 - 4x = 0 \Rightarrow x(x-4) = 0 \Rightarrow x = 0 \quad or \quad x = 4$

10. $x + \frac{1}{x} = 3$. Multiplying throughout by x, we get
$x^2 + 1 = 3x$
i.e., $x^2 - 3x + 1 = 0$, which is a quadratic equation.
Here, a = 1, b = - 3, c = 1
So, $b^2 - 4ac = 9 - 4 = 5 > 0$
Therefore, $x = \frac{3 \pm \sqrt{5}}{2}$
So, the roots are $\frac{3+\sqrt{5}}{2}$ and $\frac{3-\sqrt{5}}{2}$

11. Given quadratic equation is $7y^2 - 4y + 5 = 0$
On comparing with $ay^2 + by + c = 0$, we get
a = 7, b = - 4 and c = 5
Now, $D = b^2 - 4ac = (-4)^2 - 4(7)(5)$
$= 16 - 140 = -124 < 0$
Since, D < 0, so given quadratic equation has no real roots.

**Multiple Choice Question**

12. (d) $b^2 - 4ac < 0$
13. (b) -5/2
14. (c) -12
15. (d) 0
16. (a) $p \geq -9/2$
17. (c) $5x + 3y^2 = 0$
18. (a) 12m and 18m
19. (d) $\pm\frac{10}{9}$

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