**SET 5**

1. **Multiple Correct Choice:** If the equation $ax^2 + 2bx + c = 0$ and $x^2 + 2r^2x + 1 = 0$ we have one common root and a,b,c are in A.P ($r^2 \neq 1$), then the roots of the equation $x^2 + 2r^2x + 1 = 0$ are

   (a) $\dfrac{-a}{c}$

   (b) $\dfrac{-c}{a}$

   (c) $\dfrac{b}{a}$

   (d) $\dfrac{a}{b}$

2. **Multiple Correct Choice:** If $x^2 - 2x + sin^{\theta}$ =0, then x may lie in the set

   -1,1

   0,2

   -2,2

   1,2

3. **Multiple Correct Choice:** If $\beta$ is one root of the equation $4y^2 + 2y - 1 = 0$, then the other root is

   (a) $\dfrac{1}{2} - \beta$

   (b) $\dfrac{-1}{2} - \beta$

   (c) $4\beta^3 + 3\beta$

   (d) $4\beta^3 - 3\beta$

4. **Multiple Correct Choice:** Let a,b be two distinct roots of $x^4 + x^3 - 1 = 0$ and p(x) $=x^6 + x^4 + x^3 - x^2 - 1$

   (a) ab is a root of p(x) = 0

   (b) a+b is a root of p(x) =0

   (c) both a+b and ab are roots of p(x) =0

   (d) none of ab,a+b is a root of p(x) = 0

5. **Multiple Correct Choice:** Let a,b,c be the sides of an obtuse angled triangle with $\angle C > \dfrac{\pi}{2}$. The equation $a^2x^2 + (b^2 + a^2 - c^2)x + b^2 = 0$ has

   (a) two positive roots

   (b) one positive and one negative root

   (c) two real roots

   (d) two imaginary roots.

6. **Multiple Correct Choice:** Let $\beta$ be repeated root of p(x) $x^3 + 3ax^2 + 3bx + c = 0$ then

(a) $\beta$ is a root of $x^2 + 2ax + b = 0$

(b) $\beta = \dfrac{c - ab}{2(a^2 - b)}$

(c) $\beta = \dfrac{ab - c}{a^2 - b}$

(d) $\beta$ is a root of $ax^2 + 2bx + c = 0$

7. **Multiple Correct Choice:** If n is an even number and $\alpha, \beta$ are the roots of equation $x^2 + px + q = 0$ and also of equation $x^{2n} + p^n x^n + q^n = 0$ and f(x) $= \dfrac{(1+x)^n}{1+x^n}$, then f($\dfrac{\alpha}{\beta}$) = ( where $\alpha^n + \beta^n \neq 0, p \neq 0$)

   (a) 0

   (b) 1

   (c) -1

   (d) none of these

8. **Comprehension Type:** Suppose two quadratic equations $p_1x^2 + q_1x + r_1 = 0$ and $p_2x^2 + q_2x + r_2 = 0$ have a common root $\beta$, then $p_1\beta^2 + q_1\beta + r_1 = 0$....(a) and $p_2\beta^2 + q_2\beta + r_2 = 0$......(b) Eliminating $\beta$ using cross multiplication method gives us the condition for a common root. Solving two equations simultaneously, the common root can be obtained. Now consider three quadratic equations, $x^2 - 2ab_mx + t = 0; m = 1, 2, 3$ Given that each pair has exactly one root common.

   (a) The common root between the equations obtained by m =1 and m=3 is

      i. $-\sqrt{\dfrac{3}{2}}$ or $\sqrt{\dfrac{3}{2}}$

      ii. $-\sqrt{\dfrac{2}{3}}$ or $\sqrt{\dfrac{2}{3}}$

      iii. $-\sqrt{6}$ or $\sqrt{6}$

      iv. 1

   (b) The sum of all the three roots is equal to

      i. $0 or \sqrt{6}$

      ii. $\dfrac{11}{\sqrt{6}}$ or $-\dfrac{11}{\sqrt{6}}$

      iii. $\dfrac{11}{\sqrt{6}}$ or $-\sqrt{11}$

      iv. 0 or $\pm\dfrac{11}{\sqrt{6}}$

   (c) The number of the triplets $(b_1, b_2, b_3)$ for which such equations exist is

      i. 2

      ii. 3

      iii. $C_2^6$

      iv. infinite

9. **Subjective:** Find the value of x $log_{2x+3}(6x^2 + 23x + 21) + log_{3x+7}(4x^2 + 12x + 9) = 4$

10. **Subjective:** Solve the equation $x^4 + 4x^3 + 6x^2 + 4x + 5 = 0$ Given that its one root is i.

11. **Subjective:** Find the condition that the roots of the equation $x^3 - px^2 + qx - r = 0$ may be in AP hence solve the equation $x^3 - 12x^2 + 39x - 28 = 0$

12. **Subjective:** Show that the following equation can have atmost one real root. $3x^5 - 5x^3 + 21x + 3sinx + 4cosx + 5 = 0$

13. **Subjective:** Let a,b,c be positive integers. Consider the class of quadratic equations $ax^2 - bx + c = 0$ having two distinct real roots in the open interval (0,1). Find the least positive integral value of a for such equation.

14. **Subjective:** Find the set of all real a such that $5a^2 - 3a - 2, a^2 + a - 2, ; 2a^2 + a - 1$ are the lengths of sides of triangle.

15. **Subjective:** If $x \in R$ prove that the maximum value of $2(a - x)(x + \sqrt{x^2 + b^2}$ is $a^2 + b^2$

16. **Subjective:** For what values of the parameter a, the equation $x^4 + 2ax^3 + x^2 + 2ax + 1 = 0$ has at least two distinct negative roots.