IIT/EKLAVYA BATCH
THE GURUKUL INSTITUTE

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GURUKUL MATHS QUIZ -2

TIME: 3 HR **MM: 134**

M.C.Q's(More than one may be correct option)

1. $5^x + (2\sqrt{3})^{2x} - 169 \leq 0$ is true in the interval
   a) $(-\infty, 2)$ b) $(0, 2)$ c) $(2, \infty)$ d) $(0, 4)$
1. The set of all 'm' for which $mx^2 - 4x + m < 0$ for all real x is given by
   a) $m > 2$ b) $m > -2$ c) $-2 < m < 2$ d) None
2. If for the quadratic equation $ax^2 + bx + c = 0$ the product of the roots is equal to the sum of the reciprocals of the roots then
   a) a and b are of opposite sign b) a and c are of opposite sign
   c) both roots cannot be negative d) – a, c , b are in G.P
3. If the quadratic equation $ax^2 - 2bcx + c = 0$ has both roots positive then
   a) a and b must have same sign b) a and c must have sign
   c) b and c must have same sign d) a and D must have sign
4. If the equation $ax^2 - 2bx + c = 0$ has real roots which are reciprocal of each other then one has
   a) $b \leq a$ b) $|b| \geq |a|$ c) $|b| \geq |c|$ d) a = c
5. The equation $\sqrt{2}\, sin^2 x \pm (2\sqrt{2} - 1) \sin x - 2 = 0$ has two roots in the interval
   a) (0 , π) b) (π, 2π) c) $\left(\frac{3\pi}{2}, \frac{5\pi}{2}\right)$ d) $\left(\frac{-\pi}{2}, \frac{3\pi}{4}\right)$
6. $2x^2 - \cos\theta(3 + 4x) + 2 > 0$ for all real x provided θ lies in the interval
2. a) $\left(0, \frac{\pi}{3}\right)$ b) $\left(\frac{\pi}{3}, \frac{2\pi}{3}\right)$ c) $\left(\frac{2\pi}{3}, \frac{4\pi}{3}\right)$ d) $\left(\frac{4\pi}{3}, 2\pi\right)$

SUBJECTIVE PROBLEMS

1. If sum of the roots of the equation $ax^2 + bx + c = 0$ is equal to the sum of the squares of their reciprocals, show that bc^2, ca^2, ab^2 are in AP.
2. If one root of a quadratic equation $ax^2 + bx + c = 0$ is equal to nth power of the other, show that $(ac^n)^{1/n+1} + (a^n c)^{1/n+1} + b = 0$
3. If r be the ratio of the roots of the equation $ax^2 + bx + c = 0$, show that $(r+1)^2/r = b^2/ac$.
4. Solve for x: $(5 + 2\sqrt{6})^{x^2-3} + (5 - 2\sqrt{6})^{x^2-3} = 10$
5. The coefficient of x in the equation $x^2 + px + q = 0$ was wrongly written as 17 in place of 13 and the roots thus found were -2 and -15. Find the roots of the correct equation.
6. If c,d are the roots of the equation $(x - a)(x - b) - k = 0$, show that a, b are the roots of the equation $(x - c)(x - d) + k = 0$.
7. Show that if p, q,r,s are real numbers and $pr = 2(q+s)$ then at least one of the equations $x^2 + px + q = 0$ and $x^2 + rx + s = 0$ has real roots.
8. Show that the equation $e^{\sin x} - e^{-\sin x} - 4 = 0$ has no real solution.
9.