JEE MAIN : CHAPTER WISE TEST PAPER-4

SUBJECT :- MATHEMATICS **DATE.....**
CLASS :- 11th **NAME.....**
CHAPTER :- QUADRATIC EQUATION **SECTION.....**

(SECTION-A)

1. If x_1, x_2, x_3 are three distinct roots of the equation $ax^2 + bx + c = 0$, then
(A) $a = b = 0, c \in R$ (B) $a = b = c = 0$
(C) $a = c = 0, b \in R$ (D) $b^2 - 4ac \geq 0$

2. The polynomials $P(x) = kx^3 + 3x^2 - 3$ and $Q(x) = 2x^3 - 5x + k$, when divided by $(x - 4)$ leave the same remainder. The value of k, is
(A) 1 (B) 2 (C) 3 (D) 4

3. If $\frac{(x-2)^2(3-x)^3(5-x)^4}{(4-x)^5} < 0$, then the exhaustive set of real values of x, is
(A) $(-\infty, 2) \cup (5, \infty)$ (B) $(3, 4) \cup (5, \infty)$
(C) $(3, 4)$ (D) $(2, 3) \cup (4, 5)$

4. The positive roots of the equation $\left(\sqrt{200} + \sqrt{56}\right)$ $x^2 + 10x - 2\left(\sqrt{50} - \sqrt{14}\right) = 0$
(A) $\frac{\sqrt{26}}{\sqrt{14}}$ (B) $\sqrt{200} - \sqrt{56}$
(C) $\frac{5\sqrt{2} - \sqrt{14}}{9}$ (D) $\frac{10}{\sqrt{200} - \sqrt{56}}$

5. The appoximate percentage of the interval [– 5, 15] for which the inequality $x > 4 - \frac{7}{x+4}$ is satisfied, is
(A) 55% (B) 65% (C) 60% (D) 45%

6. The sum of the values of x satisfying the equation $|x^2 + 4x + 3| + 2x + 5 = 0$ is
(A) $5 + \sqrt{3}$ (B) $5 - \sqrt{3}$
(C) $-5 + \sqrt{3}$ (D) $-5 - \sqrt{3}$

7. For the polynomial $P(x) = x^4 + 4$, the correct statement is
(A) not a product of two non-constant polynomials with real coefficients.
(B) decomposes as a product of a polynomial of degree 1 and a polynomial of degree 3 with real coefficients.
(C) decomposes as a product of four polynomials of degree 1 with real coefficients.
(D) decomposes as a product of two polynomials of degree 2 with real coefficients.

8. Number of different real numbers which satisfy the equation $(x^2 + 4x - 2)^2 = (5x^2 - 1)^2$, is
(A) 4 (B) 3 (C) 2 (D) 1

9. The true solution set of the inequality $\log_7\left(\frac{2x-6}{2x-1}\right) > 0$, is
(A) $\left(-\infty, \frac{1}{2}\right)$ (B) $(4, \infty)$
(C) $\left(-\infty, \frac{1}{3}\right)$ (D) $(7, \infty)$

10. In the equation $x^2 - \frac{10x}{9} + c = 0$, one solution is the square of the other solution.
If $c > 0$ is rational number $\left(\frac{m}{n}\right)$ in the lowest term, then the value of $(m + n)$ is equal to
(A) 25 (B) 28 (C) 32 (D) 35

11. If the roots α, β of the quadratic equation $(\sin 6 + \sin 10 + \cos 10)x^2 + x + k^2 - 3k + 2 = 0$, is such that $\alpha < 0 < \beta$, then the true set of values of k is,
(A) $(-\infty, 1) \cup (2, \infty)$ (B) $(1, 2)$
(C) $(-\infty, -2) \cup (-1, \infty)$ (D) $(-2, -1)$

12. If one root of the equation $x^2 + px + 12 = 0$ is 4, while the equation $x^2 + px + q = 0$ has equals roots, then the value of q, is
(A) $\frac{49}{4}$ (B) $\frac{49}{2}$ (C) $\frac{49}{8}$ (D) $\frac{49}{16}$

13. The sum of real values of k for which the cubic $x^3 - kx + k - 1 = 0$ has exactly two distinct real solutions, is
(A) $\frac{13}{4}$ (B) $\frac{15}{4}$ (C) $\frac{3}{4}$ (D) $\frac{11}{4}$

14. Solve $x + \sqrt{5x+6} = 0$ and identify the true statement below.
(A) There are two solutions whose product is 6.
(B) There are two solutions whose product is – 6.
(C) There are no solutions to this equation.
(D) There is only one solution and it is located between $-\frac{5}{2}$ and $-\frac{1}{2}$.

15. If the equations $x^2 + px + 3 = 0$, $x^2 + qx + 5 = 0$ and $x^2 + (p + q)x + 24 = 0$ have a common negative root, then the value of $(p + q)$, is
(A) 10 (B) 12 (C) 14 (D) 16

16. If one solution of $x^3 - 2x^2 + ax + 10 = 0$ is the additive inverse of another, then which one of the following inequalities is true?
(A) $-40 < a < -30$ (B) $-30 < a < -20$
(C) $-20 < a < -10$ (D) $-10 < a < 0$

17. If the roots of the equation $x^2 - 2ax + a^2 + a - 3 = 0$ are real and less than 3, then
(A) $a < 2$ (B) $2 \le a \le 3$
(C) $3 < a \le 4$ (D) $a > 4$

18. Let $f(x) = ax^2 + bx + c$, $a, b, c \in R$, $a > 0$ and $b = 4a\lambda$ where $\lambda \in I$ and f satisfies $f(1) > f(2) < f(4) < f(5)$ then sum of the roots of the equation $f(x) = 0$, is
(A) 4 (B) 2 (C) -2 (D) -4

19. The sum of all values of p for which one root of the quadratic equation $x^2 + 3(1 - 3p)x + 2 = 0$ is twice as large as the other root, is
(A) 1 (B) -1
(C) $\frac{-2}{3}$ (D) $\frac{2}{3}$

20. If x is real, then the maximum value of $\frac{3x^2+9x+17}{3x^2+9x+7}$ is
(A) 41 (B) 1
(C) $\frac{1}{4}$ (D) $\frac{17}{7}$

(SECTION-B)

21. Let (x_1, x_2), (x_2, x_3) and (x_3, x_1) are respectively the roots of $x^2 - 2ax + 2 = 0$, $x^2 - 2bx + 3 = 0$ and $x^2 - 2cx + 6 = 0$, where $x_1, x_2, x_3 > 0$. Find the value of $(a + b + c)$.

22. The three different polynomials $x^2 + ax + b$, $x^2 + x + ab$ and $ax^2 + x + b$ have exactly one common zero. Where a, b are non-zero real numbers. Find the value of $a + 2b$.

23. If the range of values of k for which the quadratic expression $P(x) = x^2 + 4x + k$ takes only three negative integral values is (a, b]. Find the value of $(a + b)$.

24. If P(x) be a monic polynomial of degree 3 such that

$(P(1)-2)\alpha^2 + (P(2)-5)\alpha + P(3) - 10 = 0$

$(P(1)-2)\beta^2 + (P(2)-5)\beta + P(3) - 10 = 0$

$(P(1)-2)\gamma^2 + (P(1)-5)\gamma + P(3) - 10 = 0$

where $\alpha, \beta, \gamma \in R$, then find $|P(0)|$.

25. Find the difference of largest value of the expression $10 - 3\sin^2 3x + 2\sin 6x$ to least value of expression $2\cos 2x - 4\cos x + 5$.

26. Let equations $x^2 - 3x + 4 = 0$ and $4x^2 - 2(b - 5a)x + b = 0$ $(a, b \in R)$ have a common root. If thirteen arithmetic means are inserted between a and b, then find arithmetic mean of these means.

27. If all the values of a satisfying $\max(a - 1 + 2x - x^2) < \min(x^2 - 2ax + 10 - 2a)$ also satisfy the inequality $a^2 + ka - 20 < 0$, then find number of integral values of k.

28. If $x^2 + y^2 = 4$ and m & M are the minimum and maximum value of expression $(1 - 2x^2)^2 + 4x^2y^2$, then find the value of $\left(\frac{M}{7} - 2m\right)$.

29. Let $f(x) = 1 + \log_2(\tan^2 x)$ and $g(x) = 3 + \log_2(\cot^2 x)$, $x \in \left(0, \frac{\pi}{2}\right)$.

If $h(x) = 3x^2 - (k^2 - 2k)x - 168$, $k \in R$ and $h\left(2^{f(x)} + 2^{g(x)}\right) > 0 \ \forall \ x \in \left(0, \frac{\pi}{2}\right)$, then find number of integral values of k.

30. If one of the roots of the quadratic equation $(k^2 - 2k + 2)x^2 + 4(k - 1)x - 4k^2 = 0$, $k \in R$ is less than -2, then find least integral value of k.