1. If the sum of the roots of the quadratic equation $ax^2 + bx + c = 0$ is equal to the sum of the squares of their reciprocals, then $a/c, b/a, c/b$ are in
(a) A.P. (b) G.P. (c) H.P. (d) None of these

2. Let p and q be the roots of the equation $x^2 - 2x + A = 0$ and let r and s be the roots of the equation $x^2 - 18x + B = 0$. If $p < q < r < s$ are in arithmetic progression then the values of A and B are given by
(a) A = 3, B = 77 (b) A = 3, B = 7
(c) A = -3, B = 77 (d) A = 3, B = -7

3. If the roots of the equation $x^2 + a^2 = 8x + 6a$ be real then the set of values of a is
(a) [-1, 7] (b) (-2, 8)
(c) [-2, 8] (d) None of these

4. If $x^2 - 3x + 2$ is a factor of $x^4 + q - px^2 = 0$ then p is
(a) 3 (b) 4 (c) 5 (d) 6

5. Let $2\sin^2 x + 3 \sin x - 2 > 0$ and $x^2 - x - 2 < 0$, (x is measured in radians). Then x lies in the interval:
(a) $(\pi/6, 5\pi/6)$ (b) $(-1, 5\pi/6)$ (c) $(-1, 2)$ (d) $(\pi/6, 2)$

6. Let ω & ω^2 are imaginary cube roots of unity then the equation, whose roots are $a\omega^{317}$ & $a\omega^{382}$ is -
(a) $x^2 + ax + a^2 = 0$ (b) $x^2 + a^2x + a = 0$
(c) $x^2 - ax + a^2 = 0$ (d) None

7. If product of roots of the equation $x^2 - 4mx + 3e^{2\log m} - 4 = 0$ is 8, then its roots are real, when m equals -
(a) 1 (b) 2 (c) 2 or - 2 (d) - 2

8. In a Δ PQR, $\angle R = \frac{\pi}{2}$. If $\tan\left(\frac{P}{2}\right)$ and $\tan\left(\frac{Q}{2}\right)$ are the roots of the equation $ax^2 + bx + c = 0$ $(a \neq 0)$, then
(a) a + b = c (b) b + c = 0 (c) a + c = b (d) b = c

9. For every natural number n, $3^{2n+2} - 8n - 9$ is divisible by
(a) 16 (b) 128 (c) 256 (d) None of these

10. If both roots of the quadratic equation $x^2 - 2kx + (k^2 + k - 5) = 0$ are less than 5 then k lies in interval -
(a) (5, 6) (b) (6, ∞) (c) ($-\infty$, 4) (d) [4, 5]

11. If the roots of equation $x^3 + ax^2 + b = 0$ are α_1, α_2 and α_3; (a, b $\neq$ 0) then the equation whose roots are $\frac{\alpha_1\alpha_2 + \alpha_2\alpha_3}{\alpha_1\alpha_2\alpha_3}$, $\frac{\alpha_2\alpha_3 + \alpha_3\alpha_1}{\alpha_1\alpha_2\alpha_3}$, $\frac{\alpha_1\alpha_3 + \alpha_1\alpha_2}{\alpha_1\alpha_2\alpha_3}$ are
(a) $ax^3 + bx - 1 = 0$ (b) $bx^3 + ax - 1 = 0$
(c) $ax^3 - bx - 1 = 0$ (d) $bx^3 + ax + 1 = 0$

12. The roots of the equation $x^4 - 2x^2 + 4 = 0$ are the vertices of a
(a) Square inscribed in a circle of radius 2
(b) Rectangle inscribed in a circle of radius 2
(c) Square inscribed in a circle of r = $\sqrt{2}$
(d) Rectangle in a circle of r = $\sqrt{2}$

13. The equation $2^{\frac{2\pi}{\cos^{-1}x}} - \left(a + \frac{1}{2}\right) 2^{\frac{\pi}{\cos^{-1}x}} - a^2 = 0$ has only one real root, then -
(a) $a \in [1, 3]$ (b) $a \in (-\infty, -3] \cup [1, \infty)$
(c) $a \in (1, 3)$ (d) None of these

14. If roots of the equation $3x^2 + 5x + 1 = 0$ are $(\sec\theta_1 - \tan\theta_1)$ and $(\text{cosec}\,\theta_2 - \cot\theta_2)$, then the equation whose roots are $(\sec\theta_2 + \tan\theta_2)$ and $(\text{cosec}\,\theta_2 + \cot\theta_2)$ will be -
(a) $3x^2 + 5x + 1 = 0$ (b) $x^2 + 5x + 3 = 0$
(c) $3x^2 - 9x + 7 = 0$ (d) $7x^2 - 9x + 2 = 0$

15. If the equations $ax^2 + bx + c = 0$ and $5x^2 + 12x + 13 = 0$ have a common root, where a, b and c are the sides of a triangle ABC, then
(a) ΔABC is acute angled (b) ΔABC is right angled
(c) ΔABC is isosceles (d) ΔABC is right angled isosceles

16. If x, m satisfy the inequality $\log_{1/2} x^2 \geq \log_{1/2}(x + 2)$ and $49x^2 - 4m^4 \leq 0$ then
(a) $m \in (-\infty, 1) \cup (1, \infty)$
(b) $m \in (-\infty, -\sqrt{5}) \cup (\sqrt{5}, \infty)$
(c) $m \in (-\infty, -\sqrt{7}) \cup [\sqrt{7}, \infty)$
(d) None

17. The no. of real roots of $(6 - x)^4 + (8 - x)^4 = 16$ is-
(a) 0 (b) 2 (c) 4 (d) None of these

18. The numerical difference of the roots of $x^2 - 7x - 9 = 0$ is -
(a) 5 (b) $2\sqrt{85}$ (c) $9\sqrt{17}$ (d) $\sqrt{85}$

19. If α, β be the roots of $x^2 - px + q = 0$ and α', β' be the roots of $x^2 - p'x + q' = 0$ then the value of $(\alpha - \alpha')^2 + (\beta - \alpha')^2 + (\alpha - \beta')^2 + (\beta - \beta')^2$ is -
(a) $2\{p^2 - 2q + p'^2 - 2q' - pp'\}$
(b) $2\{p^2 - 2q + p'^2 - 2q' + qq'\}$
(c) $2\{p^2 - 2q - p'^2 - 2q' + pp'\}$
(d) $2\{p^2 - 2q - p'^2 - 2q' - qq'\}$

20. Let $f(x) = ax^3 + 5x^2 - bx + 1$. If $f(x)$ when divided by $2x + 1$ leaves 5 as remainder, and $f'(x)$ is divisible by $3x - 1$ then -
(a) a = 26, b = 10 (b) a = 24, b = 12
(c) a = 26, b = 12 (d) None of these

21. If the expression $\left(mx - 1 + \frac{1}{x}\right)$ is non-negative for all positive real x, then the minimum value of m must be
(a) -1/2 (b) 0 (c) ¼ (d) ½

22. If a, b, c are positive real numbers, then the number of real roots of equation $ax^2 + b|x| + c = 0$ is -
(a) 0 (b) 1 (c) 2 (d) None of these

23. If $2a + 3b + 6c = 0$ then at least one root of the equation $ax^2 + bx + c = 0$ lies in the interval
(a) (0, 1) (b) (1, 2) (c) (2, 3) (d) (3, 4)

24. If $x^2 + 6x - 27 > 0$ and $x^2 - 3x - 4 < 0$, then -

(a) $x > 3$ (b) $x < 4$ (c) $3 < x < 4$ (d) $4 < x < 5$

25. If $x + y + z = 5$ and $xy + yz + zx = 3$, then least and largest value of x are:

(a) $\frac{10}{3}, 5$ (b) $-1, \frac{13}{3}$ (c) $\frac{17}{3}, 7$ (d) None of these