M.M.:70 **www.mathstudy.in** **Time : 70 Mints**

1. Find the set of values of a for which the quadratic polynomial $(a+4)x^2 - 2ax + 2a - 6 < 0; \forall x \in R$ [3]

2. Solve the inequality by using method of interval, $\frac{x+1}{x-1} \geq \frac{x+5}{x+1}$ [3]

3. Find the minimum vertical distance between the graphs of y =2+sinx and y =cosx [3]

4. Solve : $\frac{d}{dx}(\frac{3}{4}cosx - cos^3x)$ when $x = 18°$ [3]

5. If p,q are the roots of the quadratic equation $x^2 + 2bx + c = 0$ prove that [4]
$$2log(\sqrt{y-p} + \sqrt{y-q}) = log2 + log(y + b + \sqrt{y^2 + 2by + c})$$

6. Find the maximum and minimum value of y $= \frac{x^2 + 14x + 9}{x^2 + 2x + 3} \forall x \in R$ [4]

7. Suppose that a and b are positive real numbers such that $log_{27}a + log_9 b = 7/2$ and $log_{27}b + log_9 a = 2/3$ Find the value of ab. [4]

8. Given $sin^2y = sinx.sinz$ where x,y,z are in A.P Find all possible values of the common difference of the A.P and evaluate the sum of all the common differences which lie in the interval (0,315). [4]

9. Prove that $\frac{tan8\theta}{tan\theta} = (1 + sec2\theta)(1 + sec4\theta)(1 + sec8\theta)$ [4]

10. Find the exact value of $tan^2\frac{\pi}{16} + tan^2\frac{3\pi}{16} + tan^2\frac{5\pi}{16} + tan^2\frac{7\pi}{16}$ [4]

11. Evaluate $\sum_{n=1}^{89} \frac{1}{1 + (tann°)^2}$ [5]

12. Find the value of k for which one root of the equation of $x^2 - (k+1)x + k^2 + k - 8 = 0$ exceed 2 and other is smaller than 2. [5]

13. Let a_n be the nth term of an arithmetic progression. Let S_n be the sum of the first n terms of he arithmetic progression with $a_1 = 1$ and $a_3 = 3a_8$ Find the largest possible value of S_n [5]

14. (a) If A+B+C =π and $sin(A + \frac{C}{2}) = ksin\frac{C}{2}$ then find the value of $tan\frac{A}{2}tan\frac{B}{2}$ in terms of k.

    (b) Solve the inequality , $log_{0.5}(log_6\frac{x^2 + x}{x+4}) < 0$

    [3+4]

15. Given the product p of sines of the angles of a triangle and product q of their cosines, find the cubic equation, whose coefficients are functions of p and q and whose roots are the tangents of the angles of the triangle. [6]

16. If each pair of equations [6]
$$x^2 + p_1x + q_1 = 0; x^2 + p_2x + q_2 = 0; x^2 + p_3x + q_3 = 0$$
has exactly one root in common then show that $(p_1 + p_2 + p_3)^2 = 4(p_1p_2 + p_3p_2 + p_3p_1 - q_1 - q_2 - q_3)$