ST. JOSEPH STUDY CENTRE

12th STD: Mid Term Test-1 **MATHS** **Timing: 1 Hr 30 mins / Total Marks: 50**

I. Answer any 10 of the following questions: **[10 x 2 = 20]**

1. Find the adjoint of the following: $\begin{bmatrix} 2 & 3 & 1 \\ 3 & 4 & 1 \\ 3 & 7 & 2 \end{bmatrix}$

2. Find the rank of the following matrices by minor method: $\begin{bmatrix} 1 & -2 & 3 \\ 2 & 4 & -6 \\ 5 & 1 & -1 \end{bmatrix}$

3. Four men and 4 women can finish a piece of work jointly in 3 days while 2 men and 5 women can finish the same work jointly in 4 days. Find the time taken by one man alone and that of one woman alone to finish the same work by using matrix inversion method.

4. Solve the following systems of linear equations by Gaussian elimination method:

   $2x - 2y + 3z = 2, \quad x + 2y - z = 3, \quad 3x - y + 2z = 1$

5. Test for consistency and if possible, solve the following systems of equations by rank method.

   $2x + 2y + z = 5, \quad x - y + z = 1, \quad 3x + y + 2z = 4$

6. A 12 metre tall tree was broken into two parts. It was found that the height of the part which was left standing was the cube root of the length of the part that was cut away. Formulate this into a mathematical problem to find the height of the part which was left standing.

7. If k is real, discuss the nature of the roots of the polynomial equation $2x^2 + kx + k = 0$, in terms of k .

8. Solve the equation $9x^3 - 36x^2 + 44x - 16 = 0$ if the roots form an arithmetic progression.

9. Solve : $(x - 5)(x - 7)(x + 6)(x + 4) = 504$

10. Examine for the rational roots of $x^8 - 3x + 1 = 0$.

11. Discuss the maximum possible number of positive and negative roots of the polynomial equation

    $9x^9 - 4x^8 + 4x^7 - 3x^6 + 2x^5 + x^3 + 7x^2 + 7x + 2 = 0.$

12. Solve the following systems of linear equations by Cramer's rule: $5x - 2y + 16 = 0, \; x + 3y - 7 = 0$

II. Answer any 6 of the following questions: **[6 x 5 = 30]**

13. Find the rank of the following matrices by row reduction method: $\begin{bmatrix} 3 & -8 & 5 & 2 \\ 2 & -5 & 1 & 4 \\ -1 & 2 & 3 & -2 \end{bmatrix}$

14. A family of 3 people went out for dinner in a restaurant. The cost of two dosai, three idlies and two vadais is ₹ 150. The cost of the two dosai, two idlies and four vadais is ₹ 200. The cost of five dosai, four idlies and two vadais is ₹ 250. The family has ₹350 in hand and they ate 3 dosai and six idlies and six vadais. Will they be able to manage to pay the bill within the amount they had?

15. A boy is walking along the path $y = ax^2 + bx + c$ through the points (-6, 8), (-2, -12), and (3, 8). He wants to meet his friend at P (7, 60). Will he meet his friend? (Use Gaussian elimination method.)

16. By using Gaussian elimination method, balance the chemical reaction equation:

$C_2H_6 + O_2 \rightarrow H_2O + CO_2$

17. Solve the cubic equations: $8x^3 - 2x^2 - 7x + 3 = 0$.

18. Solve the equation $6x^4 - 5x^3 - 38x^2 - 5x + 6 = 0$ if it is known that $\frac{1}{3}$ is a solution.

19. Find the exact number of real zeros and imaginary of the polynomial $x^9 + 9x^7 + 7x^5 + 5x^3 + 3x$.

20. If the equations $x^2 + px + q = 0$ and $x^2 + p'x + q' = 0$ have a common root, show that it must be equal to

$\frac{pq'-p'q}{q-q'}$ *or* $\frac{q-q'}{p'-p}$.

----------ALL THE BEST----------

Test should be written under the supervision of your parents and get the answer paper signed from them.

No corrections should be made after the test timings. We expect your honesty.

Test Papers have to be submitted after the completion of all the 4 tests.

Submission Date of Test Papers: 27th July, 28th July, 29th July Timings: 9.30 AM – 1.00 PM / 5 PM- 8 PM