STELLA MARIS COLLEGE (AUTONOMOUS) CHENNAI - 600 086
(For candidates admitted during the academic year 2015–16& thereafter)

SUBJECT CODE : 15MT/MC/AT14

B. Sc. DEGREE EXAMINATION, NOVEMBER 2018
BRANCH I - MATHEMATICS
FIRST SEMESTER

COURSE	**:**	**MAJOR – CORE**	
PAPER	**:**	**ALGEBRA AND TRIGONOMETRY**	
TIME	**:**	**3 HOURS**	**MAX. MARKS : 100**

SECTION – A **(10X2=20)**
ANSWER ALL THE QUESTIONS

1. Define Symmetric function of roots.
2. Define Reciprocal equation.
3. State Descarte's Rule of signs.
4. Find the quotient and remainder when $3x^3 + 8x^2 + 8x + 12$ is divided by $x - 4$.
5. Define Eigen values.
6. State Cayley Hamilton theorem.
7. Prove that $\tan h2x = \frac{2\tan hx}{1+tanh^2x}$.
8. Expand $\tan n\theta$ in term of $\tan\theta$.
9. Expand $sinh^{-1}x$ in terms of logarithmic function.
10. Find $log(4 + 3i)$.

SECTION – B **(5X8=40)**
ANSWER ANY FIVE QUESTIONS

11. Solve $x^3 - 12x^2 + 39x - 28 = 0$ whose roots are in arithmetic progression.
12. Increase by 7 the roots of the equation $3x^4 + 7x^3 - 15x^2 + x - 2 = 0$.
13. Find the eigen values of the matrix $\begin{bmatrix} 1 & 2 & 0 \\ 4 & 3 & 0 \\ 5 & 6 & 7 \end{bmatrix}$.
14. Express $\frac{\sin 6\theta}{\sin\theta}$ in terms of $\cos\theta$.
15. If $\sin(A + iB) = x + iy$, prove that

    (i) $\frac{x^2}{sin^2A} - \frac{y^2}{cos^2A} = 1$.

    (ii) $\frac{x^2}{cosh^2B} - \frac{y^2}{sinh^2b} = 1$.
16. Find the characteristic equation of the matrix $A = \begin{bmatrix} 2 & 2 & 0 \\ 2 & 1 & 1 \\ -7 & 2 & -3 \end{bmatrix}$ and hence determine its inverse.
17. Prove that $2^7 cos^8\theta = \cos 8\theta + 8\cos 6\theta + 28\cos 4\theta + 56\cos 2\theta + 35$.

SECTION – C **(2X20=40)**

ANSWER ANY TWO QUESTIONS

18. (i) Solve the equation $6x^5 - x^4 - 43x^3 + 43x^2 + x - 6 = 0$. (13)

(ii) If $\propto, \beta, \gamma$ are the roots of the equation $x^3 + px^2 + qx + r = 0$, find the equation whose roots are $\alpha(\beta + \gamma), \beta(\gamma + \alpha), \gamma(\alpha + \beta)$. (7)

19. Diagonalise the matrix $A = \begin{bmatrix} 2 & -2 & 3 \\ 1 & 1 & 1 \\ 1 & 3 & -1 \end{bmatrix}$.

20. (i) Expand $sin^3\theta cos^5\theta$ in a series of sines of multiples of θ. (15)

(ii) If $tan\ \log(x + iy) = a + ib$, where $a^2 + b^2 \neq 1$, prove that

$\tan\ \log(x^2 + y^2) = \frac{2a}{1-a^2-b^2}$. (5)

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