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 2017
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 Reciprocal Equation.
2. Change the equation $2x^4 - 3x^3 + 3x^2 - x + 2 = 0$ into another in which the coefficient of x^4 will be unity.
3. Find the quotient and the remainder when $x^5 - 4x^4 + 3x^3 - 4x + 6 = 0$ is divided by $x - 3$.
4. Show that $x^6 + 3x^2 - 5x + 1 = 0$ has at least four imaginary roots.
5. Define: i)Unitary matrix
   ii)Orthogonal matrix
6. Calculate A^4 when $A = \begin{pmatrix} 1 & 2 \\ 2 & 4 \end{pmatrix}$
7. Prove that $2sinhx\ coshx = sinh2x$.
8. Find approximately the value of θ in radians if $\frac{sin\theta}{\theta} = \frac{863}{864}$.
9. Define: logarithm of a complex quantity.
10. Show that $Log(iy) = logy + 2n\pi i + \frac{\pi i}{2}$.

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

11. Solve the equation $2x^3 - 11x^2 + 10x + 8 = 0$ given that one root is twice the other.
12. If α, β, γ are the roots of $x^3 + 2x^2 + 3x + 3 = 0$, prove that $\frac{\alpha}{\alpha+1} + \frac{\beta}{\beta+1} + \frac{\gamma}{\gamma+1} = 5$.
13. Diminish the roots of the equation $x^4 - 4x^3 - 7x^2 + 22x + 24 = 0$ by 1 and hence solve the equation .
14. If α, β, γ are the roots of $x^3 + px^2 + qx + r = 0$find the equation whose roots are$(\alpha + \beta), (\beta + \gamma), (\gamma + \alpha)$ and show that $(\alpha + \beta)(\beta + \gamma)(\gamma + \alpha) = r - pq$.
15. Find the eigen vector of $thematrix \begin{pmatrix} 1 & 1 & 2 \\ 0 & 2 & 2 \\ -1 & 1 & 3 \end{pmatrix}$ corresponding to one of the eigen values .
16. Express $\frac{sin6\theta}{sin\theta}$ in terms of $cos\ \theta$
17. If $cos(x + iy) = cos\theta + isin\theta$, prove that $cos2x + cosh2y = 2$.

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SECTION – C **(2X20=40)**
ANSWER ANY TWO QUESTIONS

18. a) Solve $6x^5 + 11x^4 - 33x^3 - 33x^2 + 11x + 6 = 0$.

b) $\frac{1+tanhx}{1-tanhx}$ = cosh2x + sinh2x. (14 + 6)

19. a) Find the positive root of $2x^3 - 6x^2 + 5 = 0$ which lies between 1 and 2 using Horner's method .

b) Express $\tanh^{-1}x$ in logarithmic form. (14 + 6)

20. a) Find the characteristic equation of the matrix A = $\begin{bmatrix} 2 & 0 & -1 \\ 0 & 2 & -2 \\ 1 & -1 & 2 \end{bmatrix}$ and hence determine its inverse.

b) Find the product of the eigen values of the matrix $\begin{pmatrix} 1 & 2 & -1 \\ -2 & 0 & 0 \\ 4 & 5 & 0 \end{pmatrix}$ (14 + 6)