STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI – 600 086
(For candidates admitted during the academic year 2019-2020)

SUBJECT CODE: 19MT/MC/AT13

B.Sc. Degree Examination, November 2021
FIRST SEMESTER

COURSE : MAJOR CORE
PAPER : ALGEBRA AND TRIGONOMETRY
TIME : 3 HOURS

MAXIMUM MARKS: 100

SECTION-A
ANSWER ALL THE QUESTIONS (3 × 4 = 12)

1. Find the Eigen values of A^2 given $A = \begin{pmatrix} 1 & -5 & 7 \\ 0 & 3 & -9 \\ 0 & 0 & -2 \end{pmatrix}$.
2. Frame the equation whose roots are $3, -\sqrt{5}$.
3. Prove that $\cosh 2x = 2cosh^2 x - 1$.

SECTION – B
ANSWER ANY <u>THREE</u> OF THE FOLLOWING (3 × 16 = 48)

4. Verify Cayley Hamilton theorem for the matrix $A = \begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix}$ and hence find A^{-1}.
5. Sum the series $\sum_{n=1}^{\infty} \frac{n^3-n+1}{n!}$.
6. Prove that the length of a small circular arc is approximately $\frac{1}{3}(8c' - c)$ where c is the chord of the arc and c' the chord of half the arc.
7. If $(x + iy) = \cos(u + iv)$, where x, y, u, v are real prove that $(1 - x)^2 + y^2 = (\cosh v - \cos u)^2$.

SECTION – C
ANSWER ANY <u>ONE</u> OF THE FOLLOWING (1 × 40 = 40)

8. a) Find the Eigen values and Eigen vectors of the matrix $A = \begin{pmatrix} 1 & 6 & 1 \\ 1 & 2 & 0 \\ 0 & 0 & 3 \end{pmatrix}$.

   b) Show that $log_e 3 = 1 + \frac{1}{3.2^2} + \frac{1}{5.2^4} + \frac{1}{7.2^6} + \cdots$

   c) Solve the equation $6x^3 - 11x^2 + 6x - 1 = 0$ whose roots are in harmonic progression.

(20+10+10)

9. a) If α, β, γ are the roots of the equation $x^3 + px^2 + qx + r = 0$, find the value of $\frac{\alpha\beta}{\gamma} + \frac{\beta\gamma}{\alpha} + \frac{\gamma\alpha}{\beta}$.

b) Express $\frac{\sin 7\theta}{\sin \theta}$ in powers of $\sin \theta$.

c) If $\alpha + i\beta = b^{x+iy}$, prove that one value of $\frac{y}{x}$ is $\frac{2tan^{-1}\left(\frac{\beta}{\alpha}\right)}{\log(\alpha^2+\beta^2)}$. (10+20+10)

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