INDIAN INSTITUTE OF TECHNOLOGY GUWAHATI
SHORT ABSTRACT OF THESIS

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Thesis Title: Dynamics of certain One-Parameter and Two-Parameter Families of Transcendental Functions

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SHORT ABSTRACT

In the Ph.D thesis, we investigated the dynamics of some one-parameter and two-parameter family of transcendental functions.

In **Chapter 2,** for $b>1$, the dynamics of function in the two-parameter family $\mathsf{F}_b \equiv\{ f_{\lambda,\mu}(z) = \lambda b^z - \mu b^{-z} \text{ for } z\in\mathbb{C} : \lambda, \mu > 0\}$ is investigated. On the real line $\mathbb{R}$, the existence and nature of the fixed points are described. The dynamical behaviour of $f_{\lambda,\mu}$ is exhibited on the real line. The dynamics of $f_{\lambda,\mu}$ on the extended complex, is studied by tracking forward orbits of the singular values of $f_{\lambda,\mu}$ whenever real attracting and rationally indifferent fixed points exist.

In **Chapter 3,** for $b>1$, the two-parameter family $\mathsf{G}_b \equiv\{g_{\lambda,\mu}(z) = \lambda b^z + \mu b^{-z} \text{ for } z\in\mathbb{C} : \lambda \geq \mu > 0\}$ is considered. On the real line, fixed points and dynamics of $g_{\lambda,\mu}$ is investigated. The dynamics on the complex plane is obtained by tracking the forward orbits of the singular values of $g_{\lambda,\mu}$. It is shown that a bifurcation occurs in the two-parameter family $g_{\lambda,\mu}$. Some applications of the dynamics of $g_{\lambda,\mu}$ are provided.

In **Chapter 4,** one-parameter families $\mathcal{F} \equiv \left\{ f_\lambda(z) = \lambda \left(\cosh z + \frac{1}{\cosh z} \right) \text{ for } z \in \mathbb{C} : \lambda > 0 \right\}$ and $\mathcal{G} \equiv \left\{ g_\lambda(z) = \lambda \left(\cosh z - \frac{1}{\cosh z} \right) \text{ for } z \in \mathbb{C} : \lambda > 0 \right\}$ of transcendental meromorphic functions, are considered. For both the functions f_λ and g_λ, the dynamics is studied. It is observed that the dynamical behaviours are completely different.

In **Chapter 5,** the dynamics of function in the one-parameter family $\mathcal{F} \equiv \{ f_\lambda(z) = \lambda + \cosh z : \lambda \in \mathbb{R} \}$ is investigated. On the real line $\mathbb{R}$, the fixed points and the dynamics are studied. The dynamics of f_λ on the complex plane is studied for some cases theoretically and remaining cases numerically. It is observed that a period doubling bifurcation occurs in the family $\mathcal{F}$.