Poincare Journal of Analysis & Applications
Vol. 9, No. 2 (2022), 201-212

NEVANLINNA METHOD OF OBTAINING SOLUTION OF A SYSTEM OF q-SHIFT COMPLEX DIFFERENTIAL-DIFFERENCE EQUATIONS

A. TANUJA

Date of Receiving : 17. 04. 2022
Date of Revision : 18. 07. 2022
Date of Acceptance : 30. 07. 2022

Abstract. The Nevanlinna theory of value distribution is used to investigate the existence of a meromorphic solution to a general system of q-shift complex differential-difference equations whose coefficients are small functions of the meromorphic function. Several limiting cases are reported in the study and an example is given to complement our result. A note is added about problems for which the method does not work.

1. Background

Ordinary differential-difference equations are widely used as models to describe many problems of dynamics in various fields of science, particularly in fluid mechanics, solid state physics, plasma physics, and so on. Many methods have been developed by mathematicians and physicists to find solutions of ordinary differential-difference equations but there is no unified technique that can be employed to handle all types of differential-difference equations.

The motivation of the present work is to investigate the existence of a meromorphic solution for general systems of such types of differential-difference equations by using the Nevanlinna theory. Our results show that the method provides a powerful mathematical tool for solving many differential-difference equations appearing in mathematical physics and also several results are reported as corollaries of our result. Some works have reported solutions for certain types of complex differential equations ([20], [21], [26]).

The non-autonomous Schröder q-difference equation

$$f(qz) = R(z, f(z)),$$

2010 *Mathematics Subject Classification.* Primary 30D05, 39B32, 30D35.
Key words and phrases. Complex differential-difference equations, Meromorphic functions, Nevanlinna theory, q-shift.
Communicated by. Sanjib Kumar Datta