

## VALUE DISTRIBUTION OF GENERAL $q$ -DIFFERENCE-DIFFERENTIAL POLYNOMIALS OF A MEROMORPHIC FUNCTION

RENUKADEVI S. DYAVANAL AND JYOTI B. MUTTAGI

**ABSTRACT.** The main purpose of this paper is to investigate the growth condition as well as the distribution of zeros of the most general polynomial generated by shifts,  $q$ -shifts and derivatives of a meromorphic function. Meanwhile the results obtained in this paper not only generalize but also improve the earlier results of Zheng and Xu [20] by removing the conditions on the zeros and poles of a meromorphic function.

### REFERENCES

- [1] D.C. Barnett, R.G. Halburd, R.J. Korhonen and W. Morgan: *Nevanlinna theory for the  $q$ -difference operator and meromorphic solutions of  $q$ -difference equations*, Proc. Roy. Soc. Edinburgh Sect. A, **137**(2007), No. 3, 457-474.
- [2] S.S. Bhoosnurmath, R.S. Dyavanal and M. Barki: *Value distribution of a differential monomial*, J. Adv. Math. Stud., **14**(2021), No. 2, 258-264.
- [3] Y.M. Chiang and S.J. Feng: *On the Nevanlinna characteristic of  $f(z + \eta)$  and difference equations in the complex plane*, Ramanujan J., **16**(2008), No. 1, 105-129.
- [4] J. Clunie: *On integral and meromorphic functions*, J. Lond. Math. Soc. (2), **1**(1962), No. 1, 17-27.
- [5] R.S. Dyavanal and M. M. Mathai: *Value distribution of general differential-difference polynomials of meromorphic functions*, J. Anal., **27**(2019), No. 4, 931-942.
- [6] R.S. Dyavanal and J.B. Muttagi: *Growth of a solution of a  $q$ -difference-differential equation*, J. Adv. Math. Stud., **13**(2020), No. 1, 88-96.
- [7] R.S. Dyavanal and J.B. Muttagi: *Uniqueness of a meromorphic functions and its linear difference polynomial sharing values partially*, J. Adv. Math. Stud., **14**(2021), No. 2, 231-235.
- [8] R.G. Halburd and R.J. Korhonen: *Difference analogue of the lemma on the logarithmic derivative with applications to difference equations*, J. Math. Anal. Appl., **314**(2006), No. 2, 477-487.
- [9] R.G. Halburd, R.J. Korhonen and K. Toghe: *Holomorphic curves with shift-invariant hyperplane preimages*, Trans. Amer. Math. Soc., **366**(2014), No. 8, 4267-4298.
- [10] W.K. Hayman: *Meromorphic functions*, Clarendon Press, Oxford, 1964.
- [11] Y. He and X. Xiao: *Algebroid functions and ordinary differential equations*, Science Press, Beijing, 1988.
- [12] Z.B. Huang and Z.X. Chen: *A Clunie lemma for difference and  $q$ -difference polynomials*, Bull. Aust. Math. Soc., **81**(2010), No. 1, 23-32.
- [13] I. Laine: *Nevanlinna Theory and Complex Differential Equations*, De Gruyter, Berlin, 1993 (GSM 15).
- [14] I. Laine and C.C. Yang: *Clunie theorems for difference and  $q$ -difference polynomials*, J. Lond. Math. Soc. (2), **76**(2007), No. 3, 556-566.
- [15] S. Lan and Z. Chen: *Zeros of some difference polynomials*, Adv. Difference Equ., 2013, 2013:194, 11 pages.

---

*Received:* January 22, 2022. *Revised:* June 12, 2022.

2010 *Mathematics Subject Classification:* 30D35, 39A05.

*Key words and phrases:* Nevanlinna theory,  $q$ -difference-differential polynomial  $f(z)$ , meromorphic function of  $f(z)$ .

- [16] Y. Liu, Y. Cao, X. Qi and H. Yi: *Value sharing results for  $q$ -shifts difference polynomials*, Discrete Dyn. Nat. Soc., **2013**(2013), Article ID 152069, 6 pages.
- [17] C.C. Yang and Z. Ye: *Estimates of the proximate function of differential polynomials*, Proc. Japan Acad. Ser. A Math. Sci., **83**(2007), No. 4, 50-55.
- [18] C.C. Yang and H.X. Yi: *Uniqueness Theory of Meromorphic Functions*, Kluwer Academic Publishers, Dordrecht, 2003 (Chinese Original Science Press, Beijing, 1995).
- [19] J.L. Zhang and R.J. Korhonen: *On the Nevanlinna characteristic of  $f(qz)$  and its applications*, J. Math. Anal. Appl., **369**(2010), No. 2, 537-544.
- [20] X.M. Zheng and H.Y. Xu: *On the deficiencies of some differential-difference polynomials*, Abstr. Appl. Anal., **2014**(2014), Article ID 378151, 12 pages.

*Karnatak University*

*Department of Mathematics*

*Pavate Nagar, Dharwad – 580003, India*

*E-mail address: renukadyavanal@gmail.com; rsdyavanal@kud.ac.in*

*Karnatak University*

*Department of Mathematics*

*Pavate Nagar, Dharwad – 580003, India*

*E-mail address: jyo5.dec@gmail.com*