COEFFICIENT PROBLEMS OF A CLASS OF q–STARLIKE FUNCTIONS ASSOCIATED WITH q–ANALOGUE OF AL–OBOUDI–AL–QAHTANI INTEGRAL OPERATOR AND NEPHROID DOMAIN

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Abstract. This investigation is on a set $SN_q^*(n, \tau; \eta)$ of q-starlike functions defined by using a newly defined q-analogue of Al-Oboudi-Al-Qahtani integral operator along with subordination and nephroid domain. This new q-operator generalizes some known integral operators. Results such as coefficient bounds, Fekete-Szegö problem (for real and complex parameters) and bounds of some Hankel determinants are presented. Our results generalize some known and new ones.

REFERENCES

[1] H. ALDWEBY AND M. DARUS, *Coefficient estimates of classes of q-starlike and q-convex functions*, Adv. Stud. Contemp. Math., **26**, 1 (2016), 21–26.

[2] F. M. AL-OBOUDI AND Z. M. AL-QAHTANI, *Application of differential subordinations to some properties of linear operators*, Internat. J. Open Probl. Complex Anal., **2**, 3 (2010), 189–202.

[3] R. O. AYINLA AND T. O. OPOOLA, *The Fekete Szegö functional and second Hankel determinant for a certain subclass of analytic functions*, Appl. Math., **10**, (2019), 1071–1078.

[4] R. A. BELLO AND T. O. OPOOLA, *Upper bounds for Fekete-Szegö functions and the second Hankel determinants for a class of starlike functions*, Internat. J. Math., **13**, 2 (2017), 34–39.

[5] D. G. CANTOR, *Power series with integral coefficients*, Bull. Amer. Math. Soc., **69**, (1963), 362–366.

[6] C. CHARLIERA AND R. GHARAKHLOO, *Asymptotics of Hankel determinants with a Laguerre-type or Jacobi-type potential and Fisher-Hartwig singularities*, Adv. Math., **383**, (2021), 69 pp.

[7] W. CHU, *Hankel determinants of factorial fractions*, Bull. Aust. Math. Soc., **105**, 1 (2022), 46–57.

[8] K. DILCHER AND L. JIU, *Orthogonal polynomials and Hankel determinants for certain Bernoulli and Euler polynomials*, J. Math. Anal. Appl., **497**, 1 (2021), 124–855.

[9] J. DZIOK, R. K. RAINA AND J. SOKÓŁ, *On a class of starlike functions related to a shell-like curve connected with Fibonacci numbers*, Math. Comp. Model., **57**, (2013), 1203–1211.

[10] M. FEKETE AND G. SZEGÖ, *Eine bemerkung über ungerade schlichte funktionen*, J. Lond. Math. Soc., **8**, (1933), 85–89.

[11] S. GANDHI AND V. RAVICHANDRAN, *Starlike functions associated with a lune*, Asian-Eur. J. Math., **10**, 3 (2017), 1–12.

[12] M. E. H. ISMAIL, E. MERKES AND D. STYER, *A generalization of starlike functions*, Comp. Var., Theory Appl., **14**, (1990), 77–84.

[13] A. ITS AND I. KRASOVSKY, *Hankel determinant and orthogonal polynomial for the Gaussian weight with a jump*, Contemp. Math., **458**, (2008), 215–248.

[14] F. H. JACKSON, *On q-functions and a certain difference operator*, Trans. Roy. Soc. Edinb., **46**, 2 (1908), 253–281.

[15] F. H. JACKSON, *On q-difference equation*, Amer. J. Math., **32**, 4 (1910), 305–314.

[16] F. H. JACKSON, *On q-definite integrals*, Quart. J. Pure Appl. Math., **41**, (1910), 193–203.

[17] W. JANOWSKI, *Some extremal problems for certain families of analytic functions I*, Ann. Polon. Math., **28**, 3 (1973), 297–326.

[18] A. JUNOD, *Hankel determinants and orthogonal polynomials*, Expo. Math., **21**, (2003), 63–74.

[19] V. KAC AND P. CHEUNG, *Quantum Calculus*, Springer-Verlag Inc, New York, 2002.

[20] S. KANAS AND D. RĂDUCANU, *Some classes of analytic functions related to conic domains*, Math. Slovaca, **64**, 5 (2014), 1183–1196.

[21] S. KANAS AND A. WIŚNIOWSKA, *Conic regions and k-uniform convexity*, J. Comput. Appl. Math., **105**, (1999), 327–336.

[22] F. R. KEOGH AND E. P. MERKES, *A coefficient inequality for certain classes of analytic functions*, Proc. Amer. Math. Soc., **20**, 1 (1969), 8–12.

[23] M. G. KHAN, B. AHMAD, W. K. MASHWANI, T. G. SHABA AND M. ARIF, *Third Hankel determinant problem for certain subclasses of analytic functions associated with nephroid domain*, Earthline J. Math. Sci., **6**, 2 (2021), 293–308.

[24] B. KHAN, H. M. SRIVASTAVA, N. KHAN, M. DARUS, Q. Z. AHMAD AND M. TAHIR, *Applications of certain conic domains to a subclass of q-starlike functions associated with the Janowski functions*, Symmetry, **13**, 574 (2021), 18 pp.

[25] K. KUROKI AND S. OWA, *Notes on new class for certain analytic functions*, Adv. Math. Sci. J., **1**, 2 (2012), 127–131.

[26] A. O. LASODE AND T. O. OPOOLA, *Fekete-Szegö estimates and second Hankel determinant for a generalized subfamily of analytic functions defined by q-differential operator*, Gulf J. Math., **11**, 2 (2021), 36–43.

[27] A. O. LASODE AND T. O. OPOOLA, *On a generalized class of bi-univalent functions defined by subordination and q-derivative operator*, Open J. Math. Anal., **5**, 2 (2021), 46–52.

[28] A. O. LASODE AND T. O. OPOOLA, *Some investigations on a class of analytic and univalent functions involving q-differentiation*, Eur. J. Math. Anal., **2**, 12 (2022), 1–9.

[29] J. W. LAYMAN, *The Hankel transform and some of its properties*, J. Integer Seq., **4**, (2001), 1–11.

[30] A. E. LIVINGSTON, *The coefficients of multivalent close-to-convex functions*, Proc. Amer. Math. Soc., **21**, (1969), 545–552.

[31] R. K. MAURYA AND P. SHARMA, *A class of starlike functions associated with petal like region on the positive half of complex plane*, J. Indian Math. Soc., **87**, 3 (2020), 165–172.

[32] K. I. NOOR, *Hankel determinant problem for the class of functions with bounded boundary rotation*, Rev. Roum. Math. Pures. Et. Appl., **28**, (1983), 731–739.

[33] K. I. NOOR, *Some classes of analytic functions associated with q-Rrusheweyh differential operator*, Facta Univ. Ser. Math. Inform., **33**, (2018), 531–538.

[34] E. A. OYEKAN AND S. O. ADERIBOLE, *New results on the Chebyshev polynomial bounds for classes of univalent functions*, Asia Pac. J. Math., **7**, (2020), 1–10.

[35] C. POMMERENKE, *On the coefficients and Hankel determinants of univalent functions*, Proc. Lond. Math. Soc., **41**, 1 (1966), 111–122.

[36] C. POMMERENKE, *On the Hankel determinants of univalent functions*, Mathematik., **14**, 1 (1967), 108–112.

[37] M. H. PRIYA AND R. B. SHARMA, *On a class of bounded turning functions subordinate to a leaf-like domain*, J. Phy. Conf. Ser., **1000**, 1 (2018), 1–14.

[38] C. RAMACHANDRAN, T. SOUPRAMANIEN AND B. A. FRASIN, *New subclasses of analytic functions associated with q-difference operator*, Eur. J. Pure Appl. Math., **10**, 2 (2017), 348–362.

[39] G. S. SĂLĂGEAN, *Subclasses of univalent functions*, Lect. Notes Math., **1013**, (1983), 362–372.

[40] T. M. SEOUDY AND M. K. AOUF, *Coefficient estimates of new classes of q-starlike and q-convex functions of complex order*, J. Math. Inequal., **10**, 1 (2016), 135–145.

[41] T. M. SEOUDY AND A. E. SHAMMAKY, *Certain subclasses of spiral-like functions associated with q-analogue of Carlson-Shaffer operator*, AIMS Math., **6**, 3 (2020), 2525–2538.

[42] K. SHARMA, N. K. JAIN AND V. RAVICHANDRAN, *Starlike functions associated with a cardioid*, Afr. Math., **27**, 5 (2016), 923–939.

[43] J. SOKÓŁ AND J. STANKIEWICZ, *Radius of some subclasses of strongly starlike functions*, Zesz. Nauk. Politech. Rzeszowskiej. Math., **19**, (1996), 101–105.

[44] H. M. SRIVASTAVA, *Operators of basic (or q-) calculus and fractional q-calculus and their applications in geometric function theory of complex analysis*, Iran. J. Sci. Technol. Trans. Sci. Review paper, (2019).

[45] R. SRIVASTAVA AND H. M. ZAYED, *Subclasses of analytic functions of complex order defined by q-derivative operator*, Stud. Univ. Babés-Bolyai Math., **64**, 1 (2019), 71–80.

[46] A. SWAMINATHAN AND L. A. WANI, *Sufficiency for nephroid starlikeness using hypergeometric functions*, Math Meth Appl Sci. (2021), 1–14.

[47] D. K. THOMAS, N. TUNESKI AND A. VASUDEVARAO, *Univalent Functions: A Primer*, Walter de Gruyter, Inc, Berlin, 2018.

[48] W. UL-HAQ AND K. I. NOOR, *A certain class of analytic functions and the growth rate of Hankel determinant*, J. Inequal. Appl., **2012**, 1 (2012), 1–11.

[49] Z. WANG, S. HUSSAIN, M. NAEEM, T. MAHMOOD AND S. KHAN, *A subclass of univalent functions associated with q-analogue of Choi-Saigo-Srivastava operator*, Hacet. J. Math. Stat., **49**, 4 (2020), 1471–1479.

[50] L. A. WANI AND A. SWAMINATHAN, *Starlike and convex functions associated with a nephroid domain*, Bull. Malays. Math. Sci. Soc., **44**, 1 (2020), 79–104.

[51] L. A. WANI AND A. SWAMINATHAN, *Radius problems for functions associated with a nephroid domain*, Rev. R. Acad. Cienc. Exactas Fís. Nat. Ser. A Mat. RACSAM., **114**, 4 (2020), 20 pp.

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