

Find out how to access preview-only content

Look inside Get Access

Russian Journal of Mathematical Physics

March 2013, Volume 20, Issue 1, pp 110-120

Some generalized Lagrange-based Apostol-Bernoulli, Apostol-Euler and Apostol-Genocchi polynomials

Abstract

In this paper, we introduce a general family of Lagrange-based Apostol-type polynomials thereby unifying the Lagrange-based Apostol-Bernoulli and the Lagrange-based Apostol-Genocchi polynomials. We also define Lagrange-based Apostol-Euler polynomials via the generating function. In terms of these generalizations, we find new and useful relations between the unified family and the Apostol-Euler polynomials. We also derive their explicit representations and list some basic properties of each of them. Further relations between the above-mentioned polynomials, including a family of bilinear and bilateral generating functions, are given. Moreover, a generating relation involving the Stirling numbers of the second kind is derived.



Citations

Related Content



References (45)

1. T. M. Apostol, "On the Lerch Zeta Function," *Pacific J. Math.* **1**(1), 161–167 (1951). [CrossRef](#)
2. A. Bayad, "Fourier Expansions for Apostol-Bernoulli, Apostol-Euler and Apostol-Genocchi Polynomials," *Math. Comp.* **80**(276), 2219–2221 (2011). [CrossRef](#)
3. G. Bretti and P. E. Ricci, "Multidimensional Extensions of the Bernoulli and Appell Polynomials," *Taiwanese J. Math.* **8**(3), 415–428 (2004).
4. W.-Ch. C. Chan, Ch.-J. Chyan, and H. M. Srivastava, "The Lagrange Polynomials in Several Variables," *Integral Transforms Spec. Funct.* **12**(2), 139–148 (2001). [CrossRef](#)
5. J. Choi, P. J. Anderson and H. M. Srivastava, "Some q -Extensions of the Apostol-Bernoulli and the Apostol-Euler Polynomials of Order n , and the Multiple Hurwitz Zeta Function," *Appl. Math. Comput.* **199**(2), 723–737 (2008). [CrossRef](#)
6. J. Choi, P. J. Anderson, and H. M. Srivastava, "Carlitz's q -Bernoulli and q -Euler Numbers and Polynomials and a Class of q -Hurwitz Zeta Functions," *Appl. Math. Comput.* **215**(3), 1185–1208 (2009). [CrossRef](#)
7. J. Choi, D. S. Jang, and H. M. Srivastava, "A Generalization of the Hurwitz-Lerch Zeta Function," *Integral Transforms Spec. Funct.* **19**(1–2), 65–79 (2008).
8. E. Deeba and D. Rodriguez, "Stirling's Series and Bernoulli Numbers," *Amer. Math. Monthly* **98**(5), 423–426 (1991). [CrossRef](#)
9. E. Erkuş and H. M. Srivastava, "A Unified Presentation of Some Families of Multivariable Polynomials," *Integral Transforms Spec. Funct.* **17**(4), 267–273 (2006). [CrossRef](#)
10. M. Garg, K. Jain, and H. M. Srivastava, "Some Relationships Between the Generalized Apostol-Bernoulli Polynomials and Hurwitz-Lerch Zeta Functions," *Integral Transforms Spec. Funct.* **17**(11), 803–815 (2006). [CrossRef](#)
11. B. K. Karande and N. K. Thakare, "On the Unification of Bernoulli and Euler Polynomials," *Indian J. Pure Appl. Math.* **6**(1), 98–107 (1975).
12. S. Khan, G. Yasmin, R. Khan, and N. A. Makhoul Hassan, "Hermite-Based Appell Polynomials: Properties and Applications," *J. Math. Anal. Appl.* **351**(2), 756–764 (2009). [CrossRef](#)
13. S. Khan, M. W. Al-Saad, and R. Khan, "Laguerre-Based Appell Polynomials: Properties and

- Applications,” *Math. Comput. Modelling* **52**(1–2), 247–259 (2010). CrossRef
14. V. Kurt, “A Further Symmetric Relation on the Analogue of the Apostol-Bernoulli and the Analogue of the Apostol-Genocchi Polynomials,” *Appl. Math. Sci. (Ruse)* **3**(53–56), 2757–2764 (2009).
 15. S.-J. Liu, S.-D. Lin, H. M. Srivastava, and M.-M. Wong, “Bilateral Generating Functions for the Erkuş-Srivastava Polynomials and the Generalized Lauricella Functions,” *Appl. Math. Comput.* **218**(15), 7685–7693 (2012). CrossRef
 16. D.-Q. Lu and H. M. Srivastava, “Some Series Identities Involving the Generalized Apostol Type and Related Polynomials,” *Comput. Math. Appl.* **62**(9), 3591–2602 (2011). CrossRef
 17. Q.-M. Luo, “On the Apostol-Bernoulli Polynomials,” *Cent. Eur. J. Math.* **2**(4), 509–515 (2004). CrossRef
 18. Q.-M. Luo, “Apostol-Euler Polynomials of Higher Order and Gaussian Hypergeometric Functions,” *Taiwanese J. Math.* **10**(4), 917–925 (2006).
 19. Q.-M. Luo, “The Multiplication Formulas for the Apostol-Bernoulli and Apostol-Euler Polynomials of Higher Order,” *Integral Transforms Spec. Funct.* **20**(5–6), 377–391 (2009). CrossRef
 20. Q.-M. Luo, “Fourier Expansions and Integral Representations for Genocchi Polynomials,” *J. Integer Seq.* **12**(1), Article 09.1.4, 9 pp. (2009).
 21. Q.-M. Luo, “ q -Extensions for the Apostol-Genocchi Polynomials,” *Gen. Math.* **17**(2), 113–125 (2009).
 22. Q.-M. Luo, “Fourier Expansions and Integral Representations for the Apostol-Bernoulli and Apostol-Euler Polynomials,” *Math. Comp.* **78**(268), 2193–2208 (2009). CrossRef
 23. Q.-M. Luo, “An Explicit Relationship Between the Generalized Apostol-Bernoulli and Apostol-Euler Polynomials Associated with λ -Stirling Numbers of the Second Kind,” *Houston J. Math.* **36**(4), 1159–1171 (2010).
 24. Q.-M. Luo, “ q -Analogues of Some Results for the Apostol-Euler Polynomials,” *Adv. Stud. Contemp. Math. (Kyungshang)* **20**(1), 103–113 (2010).
 25. Q.-M. Luo, “Extensions of the Genocchi Polynomials and Their Fourier Expansions and Integral Representations,” *Osaka J. Math.* **48**(2), 291–309 (2011).
 26. Q.-M. Luo and H. M. Srivastava, “Some Generalizations of the Apostol-Bernoulli and Apostol-Euler Polynomials,” *J. Math. Anal. Appl.* **308**(1), 290–302 (2005). CrossRef
 27. Q.-M. Luo and H. M. Srivastava, “Some Relationships Between the Apostol-Bernoulli and Apostol-Euler Polynomials,” *Comput. Math. Appl.* **51**(3–4), 631–642 (2006). CrossRef

28. Q.-M. Luo and H. M. Srivastava, “ q -Extensions for some Relationships Between the Bernoulli and Euler Polynomials,” *Taiwanese J. Math.* **15**(1), 241–257 (2011).
29. Q.-M. Luo and H. M. Srivastava, “Some Generalizations of the Apostol-Genocchi Polynomials and the Stirling Numbers of the Second Kind,” *Appl. Math. Comput.* **217**(12), 5702–5728 (2011). CrossRef
30. L. M. Navas, F. J. Ruiz, and J. L. Varona, “Asymptotic Estimates for Apostol-Bernoulli and Apostol-Euler Polynomials,” *Math. Comp.* **81**(279), 1707–1722 (2012). CrossRef
31. M. Ali Özarslan, “Unified Apostol-Bernoulli, Euler and Genocchi Polynomials,” *Comput. Math. Appl.* **62**(6), 2452–2462 (2011). CrossRef
32. H. Ozden and Y. Simsek, “A New Extension of q -Euler Numbers and Polynomials Related to Their Interpolation Functions,” *Appl. Math. Lett.* **21**(9), 934–939 (2008). CrossRef
33. H. Ozden, Y. Simsek, and H. M. Srivastava, “A Unified Presentation of the Generating Functions of the Generalized Bernoulli, Euler and Genocchi Polynomials,” *Comput. Math. Appl.* **60**(10), 2779–2787 (2010). CrossRef
34. Y. Simsek, “Twisted (h, q) -Bernoulli Numbers and Polynomials Related to Twisted (h, q) -Zeta Function and L -Function,” *J. Math. Anal. Appl.* **324**(2), 790–804 (2006). CrossRef
35. H. M. Srivastava, “Some Formulas for the Bernoulli and Euler Polynomials at Rational Arguments,” *Math. Proc. Cambridge Philos. Soc.* **129**(1), 77–84 (2000). CrossRef
36. H. M. Srivastava, “Some Generalizations and Basic (or q -) Extensions of the Bernoulli, Euler and Genocchi Polynomials,” *Appl. Math. Sci.* **5**(3), 390–444 (2011).
37. H. M. Srivastava and J. Choi, *Series Associated with the Zeta and Related Functions* (Kluwer Academic Publishers, Dordrecht, Boston and London, 2001). CrossRef
38. H. M. Srivastava and J. Choi, *Zeta and q -Zeta Functions and Associated Series and Integrals* (Elsevier Science Publishers, Amsterdam, London and New York, 2012).
39. H. M. Srivastava, M. Garg, and S. Choudhary, “A New Generalization of the Bernoulli and Related Polynomials,” *Russ. J. Math. Phys.* **17**(2), 251–261 (2010). CrossRef
40. H. M. Srivastava, M. Garg, and S. Choudhary, “Some New Families of Generalized Euler and Genocchi Polynomials,” *Taiwanese J. Math.* **15**(1), 283–305 (2011).
41. H. M. Srivastava, T. Kim, and Y. Simsek, “ q -Bernoulli Numbers and Polynomials Associated with Multiple q -Zeta Functions and Basic L -Series,” *Russ. J. Math. Phys.* **12**(2), 241–268 (2005).
42. H. M. Srivastava, B. Kurt, and Y. Simsek, “Some Families of Genocchi Type Polynomials and Their Interpolation Functions,” *Integral Transforms Spec. Funct.* **23**(12), 919–938 (2012). CrossRef

43. R. Tremblay, S. Gaboury, and B.-J. Fugère, “A New Class of Generalized Apostol-Bernoulli Polynomials and Some Analogues of the Srivastava-Pintér Addition Theorem,” *Appl. Math. Lett.* **24**(11), 1888–1893 (2011). CrossRef
44. S.-L. Yang, “An Identity of Symmetry for the Bernoulli Polynomials,” *Discrete Math.* **308**(4), 550–554 (2008). CrossRef
45. Z. Zhang and H. Yang, “Several Identities for the Generalized Apostol-Bernoulli Polynomials,” *Comput. Math. Appl.* **56**(12), 2993–2999 (2008). CrossRef

About this Article

Title

Some generalized Lagrange-based Apostol-Bernoulli, Apostol-Euler and Apostol-Genocchi polynomials

Journal

Russian Journal of Mathematical Physics
Volume 20, Issue 1 , pp 110-120

Cover Date

2013-03-01

DOI

10.1134/S106192081301010X

Print ISSN

1061-9208

Online ISSN

1555-6638

Publisher

Springer US

Additional Links

- [Register for Journal Updates](#)
- [Editorial Board](#)
- [About This Journal](#)
- [Manuscript Submission](#)

Topics

- [Theoretical, Mathematical and Computational Physics](#)

Authors

- [H. M. Srivastava](#) ⁽¹⁴¹⁹⁴⁾
- [M. A. Özarslan](#) ⁽²⁴¹⁹⁴⁾

- C. Kaanoğlu⁽³⁴¹⁹⁴⁾

Author Affiliations

- 14194. Department of Mathematics and Statistics, University of Victoria, Victoria, British Columbia, V8W 3R4, Canada
- 24194. Department of Mathematics, Faculty of Arts and Sciences, Eastern Mediterranean University Gazimağusa, TR-33310, Mersin, Turkey
- 34194. Department of Mathematics, Faculty of Engineering, Cyprus International University, Lefkoşa, TR-33310, Mersin, Turkey

Continue reading...

To view the rest of this content please follow the download PDF link above.

Over 8.5 million scientific documents at your fingertips
© Springer, Part of Springer Science+Business Media



10% Discount

Valid for all
eBooks in the
Springer Shop

