Eigenfunction Expansions for Singular Impulsive Dynamic Dirac Systems

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Abstract

In this article, a spectral function for the singular impulsive dynamic Dirac system is obtained. In terms of this function, the Parseval equality and expansion formula in eigenfunctions is given.

References

- Allahverdiev BP, Tuna H (2019) Eigenfunction expansion in the singular case for Dirac systems on time scales. Konuralp J Math 7(1):128–135

  MathSciNet MATH Google Scholar

- Allahverdiev BP, Tuna H (2023) Impulsive Dirac system on time scales. Ukrainian Math J 75(6):723–735

  Article MathSciNet MATH Google Scholar

- Allahverdiev BP, Tuna H (2022) Spectral expansion for discontinuous singular Dirac systems. Honam Math J 44(4):473–484

  MathSciNet MATH Google Scholar

- Aydemir K, Olgar H, Mukhtarov OSh (2019) The principal eigenvalue and the principal eigenfunction of a boundary-value-transmission problem. Turkish J Math Comput Sci 11(2):97–100

  MATH Google Scholar

- Aydemir K, Olgar H, Sh O, Mukhtarov F. Muhtarov (2018) Differential operator equations with interface conditions in modified direct sum spaces. Filomat 32(3):921–931

  Article MathSciNet MATH Google Scholar

- Aygar Y, Bairamov E (2019) Scattering theory of impulsive Sturm–Liouville equation in quantum calculus. Bull Malays Math Sci Soc 42(9):3247–3259

  Article MathSciNet MATH Google Scholar

- Bohner M, Cebesoy S (2019) Spectral analysis of an impulsive quantum difference operator. Math Meth Appl Sci 42:5331–5339

  Article MathSciNet MATH Google Scholar

- Bohner M, Peterson A (2001) Dynamic Equations on Time Scales. Birkhäuser, Boston

Book MATH Google Scholar

- Guseinov GSh (2008) An expansion theorem for a Sturm–Liouville operator on semi-unbounded time scales. Adv Dyn Syst Appl 3(1):147–160

  MathSciNet MATH Google Scholar

- Guseinov GSh (2007) Eigenfunction expansions for a Sturm–Liouville problem on time scales. Int J Diff Equ 2(1):93–104

  MathSciNet MATH Google Scholar

- Huseynov A, Bairamov E (2009) On expansions in eigenfunctions for second order dynamic equations on time scales. Nonlinear Dyn Syst Theory 9(1):77–88

  MathSciNet MATH Google Scholar

- Karahan D, Mamedov KhR (2021) On a q-boundary value problem with discontinuity conditions. Vestn Yuzhno-Ural Gos Un-ta Ser Matem Mekh Fiz 13(4):5–12
  MATH Google Scholar

- Karahan D, Mamedov KhR (2022) On a q-analogue of the Sturm–Liouville operator with discontinuity conditions. Vestn Samar Gos Tekh Univ, Ser Fiz-Mat Nauk 26(3):407–418
  Article MATH Google Scholar

- Karahan D, Mamedov KhR (2020) Sampling theory associated with q-Sturm-Liouville operator with discontinuity conditions. J Contemp Appl Math 10(2):40–48
  MATH Google Scholar

- Koyunbakan H, Panakhov ES (2006) Solution of a discontinuous inverse nodal problem on a finite interval. Math Comput Model 44(1–2):204–209

  Article MathSciNet MATH Google Scholar

- Lapwood FR, Usami T (1981) Free Oscillations of the Earth. Cambridge University Press, Cambridge

  MATH Google Scholar

- Levitan BM, Sargsjan IS (1991) Sturm–Liouville and Dirac operators. Mathematics and its Applications (Soviet Series). Kluwer Academic Publishers Group, Dordrecht, (translated from the Russian)

- Likov AV, Mikhailov Yu A (1965) The Theory of Heat and Mass Transfer. Translated from Russian by I. Shechtman, Israel Program for Scientific Translations, Jerusalem

- Litvinenko ON, Soshnikov VI (1964) The Theory of Heteregenous Lines and their Applications in Radio Engineering. Radio, Moscow **((in Russian))**

  MATH Google Scholar

- Ozkan AS, Amirov RKh (2011) An interior inverse problem for the impulsive Dirac operator. Tamkang J Math 42(3):259–263

  Article MathSciNet MATH Google Scholar

- Titchmarsh EC (1962) Eigenfunction Expansions Associated with Second-Order Differential Equations Part I. Second Edition Clarendon Press, Oxford

  Book MATH Google Scholar

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Ethics declarations

Conflict of interest

This work does not have any Conflict of interest.

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