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**SOME COVERING SPACES AND TYPES OF COMPACTNESS**

**Abstract:** In this paper we shall study covering spaces such as fully normal spaces,

absolutely countably compact, minimal Hausdorff, N-space, realcompact, locally

paracompact, w−compact, maximal compact. Moreover, we give refinements of

some theorems rasied in [1], also we shall give partial solutions of some open problems

raised in [2], and [3].

**Keywords:** Absolutely countably compact; fully normal; locally paracompact.

A. Jaradat, A. AL-BSOUL. (2009). SOME COVERING SPACES AND TYPES OF COMPACTNESS, Acta Math. Univ. Comenianae, Vol. LXXVIII, 1(2009), pp. 145.152.

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**Identification of time-dependent source terms and control parameters in parabolic equations from over specified boundary data**

**Abstract:** This paper presents a semigroup approach for inverse source problems for the abstract heat equation, when the measured output data is given in subject to the integral overspecification over the spatial domain. The existence of a solution to the inverse source problem is shown in appropriate function spaces and a representation formula for the solution is proposed. Such representation permits the derivation of sufficient conditions for the uniqueness of the solution. Also, an approximation method based on the optimal homotopy analysis method (OHAM) is designed, and the error estimates are discussed using graphical analysis. Moreover, we conjecture that our approach can be applied for the determination of a control parameter in an inverse problem with integral overspecialization data. The proposed algorithm is examined through various numerical examples for the reconstruction of continuous sources and the determination of a control parameter in parabolic equations. The accuracy and stability of the method are discussed and compared with several finite difference techniques. Computational results show efficiency and high accuracy of the proposed algorithm.

**Keywords:** Inverse Source Problem; Identification Problem; Semigroup Theory;

Homotopy Analysis Method.

ali Jaradat, Fadi Awawdeh, Mohd salmi Md Noorani. (2017). Identification of time-dependent source terms and control parameters in parabolic equations from over specified boundary data, Journal of Computational and Applied Mathematics, Volume 313, 15 March 2017, Pages 397-409.

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**Construction and solitary wave solutions of two-mode higher-order Boussinesq-Burger system**

**Abstract:** A new nonlinear partial differential system called two-mode higher-order Boussinesq-Burger’s system is established. We aim to use the simplified bilinear method to find the necessary constraint conditions that guarantee the existence of both regular and singular multiple soliton solutions of the model. To study the correctness of the obtained results, we use the hyperbolic-tangent expansion method as an alternative technique to investigate more possible solutions.

**Keywords:** two-mode higher-order Boussinesq-Burgers system; simplified Hirota method; N-soliton solutions; hyperbolic tangent expansion.

Ali Jaradat, Mohd salmi Md Noorani, Marwan Alquran, H.M. Jaradat. (2017). Construction and solitary wave solutions of two-mode higher-order Boussinesq-Burger system, Advances in Difference Equations. 2017(1): 376, https://doi.org/10.1186/s13662-017-1431-8.

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**A novel method for solving Caputo-time-fractional dispersive long wave Wu-Zhang system**

**Abstract:** In this paper we presented a reliable efficient numerical scheme to find analytical supportive solution of Caputo-time-fractional Wu-Zhang system. A modified version of generalized Taylor power series method is used in this work. Graphical justifications of the reliability of the proposed method are provided. Finally, the effects of the fractional order on the solution of Wu-Zhang system is also discussed.

**Keywords:** Caputo-time-fractional Wu-Zhang system; approximate solutions; generalized Taylor series.

Ali Jaradat, Mohd salmi Md Noorani, Marwan Alquran, H.M. Jaradat. (2018). A novel method for solving Caputo-time-fractional dispersive long wave Wu-Zhang system, Nonlinear Dynamics and Systems Theory, 18(2): 182-190.

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**Numerical investigations for time-fractional nonlinear model arise in physics**

**Abstract:** In this work, we suggest a numerical scheme to find analytically a solution of Caputo-time-fractional

nonlinear model arise in physics. This model is called Belousov-Zhabotinsky (BZ) and reads as

where 0 < a ≤ 1; 0 < t < R < 1. Also, a ≠–1 and r are positive parameters. A modified version of generalized Taylor power series method will be used in this work. Graphical justifications on the reliability of the proposed method are provided. Finally, the effects of the fractional order on the solution of Belousov- Zhabotinsky model is also discussed.

**Keywords:** Time-fractional Belousov-Zhabotinsky equation; Approximate solutions; Generalized Taylor series.

Ali Jaradat, Mohd salmi Md Noorani, Marwan Alquran, H.M. Jaradat. (2018). Numerical investigations for time-fractional nonlinear model arise in physics, Results in Physics, Volume 8, 2018, Pages 1034-1037.

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**A variety of new solitary-solutions for the two-mode modified Korteweg-de Vries equation**

**Abstract:** In this paper, we studied the nonlinear two-mode modified Korteweg-de Vries (TMmKdV) equation. We derived multiple singular soliton solutions to this new version of KdV equation by using the simplified form of Hirota's direct method. Also, kink and periodic solutions are extracted by using the tanh-expansion and the sine-cosine function methods. Finally, graphical analysis is conducted to show some physical features regarding TMmKdV equation.

**Keywords:** two-mode mKdV; Hirota bilinear method; sine-cosine function method; multiple singular solutions; kink and periodic solutions.

Ali Jaradat, Mohd salmi Md Noorani, Marwan Alquran, H.M. Jaradat. (2019) A variety of new solitary-solutions for the two-mode modified Korteweg-de Vries equation. Nonlinear, Dynamics and Systems Theory, 19(1):88-96.

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**Construction of (n + 1)-dimensional dual-mode nonlinear equations: multiple shock wave solutions for (3 + 1)-dimensional dual-mode Gardner-type and KdV-type**

**Abstract:** The goal of this study is to offer an exclusive functional conversion to produce (*n* + 1)-dimensional dual-mode nonlinear equations. This transformation has been implemented and new (3 + 1)-dimensional dual-mode Gardner-type and KdV-type have been established. Finally, the simplified bilinear method is used to tell the necessary conditions on these new models to have multiple singular-solitons.

**Keywords:** (3 + 1)-dimensional dual-mode Gardner-type; (3 + 1)-dimensional dual-mode KdV-type; Simplified bilinear method; Multiple singular-soliton shock wave solutions

Ali Jaradat, M.M.M. Jaradat, Mohd salmi Md Noorani, Marwan Alquran, H.M. Jaradat. (2019). Construction of (n + 1)-dimensional dual-mode nonlinear equations: multipleshock wave solutions for (3 +1)-dimensional dual-mode Gardner-type and KdV-type, Advances in Difference Equations, (2019) 2019:19.

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**THE MULTI-FUZZY GROUP SPACES ON MULTI-FUZZY SPACE**

**Abstract:** In this paper the concept of multi-fuzzy space and multi-fuzzy binary operation are presented and developed. This concept generalizes the concept of fuzzy space ([15] and [32]) to multi-membership function. These generalizations lead us to introduce and study the approach of multi-fuzzy group theory. A new theory of multi-fuzzy group is introduced and developed.

**Keywords:** multi-fuzzy space; multi-fuzzy subspaces; multi-fuzzy binary operations; multi-fuzzy group; multi-fuzzy subgroup

ALI JARADAT, ABDALLAH AL-HUSBAN (2021). THE MULTI-FUZZY GROUP SPACES ON MULTI-FUZZY SPACE, Journal of Mathematical and Computational Science, (2021).

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**ON D-COMPACT TOPOLOGICAL SPACES**

**Abstract:** In this paper D-sets will be used for the first time to define a new type of covering properties of topological spaces called D-compact spaces. This is done by defining a special type of covers called a D-cover. The main purpose of this paper is to introduce the notions of D-compact spaces. We study their properties and their relations with other topological spaces. Several examples are discussed and many will known theorems are generalized concerning D-compact spaces.

**Keywords:** Topological Space, D−set, D−cover, compact Space, D−compact Space, D−lindlof Space, D−countably compact Space, locally indiscrete space, D−continuous function, D−irresolute function.

ALI ATOOM, HAMZA QOQAZEH, YOUSEF AL-QUDAH, ALI JARADAT, NABEELA ABU ALKISHIK (2021). ON D-COMPACT TOPOLOGICAL SPACES, Journal of Mathematical and Computational Science, (2021).

**PAIRWISE LINDELO PERFECT FUNCTIONS**

**Abstract:** t. In this paper we introduce the notions and concepts of the perfect functions in the bitopological spaces, which yield to two types called p- lindelo perfect and s-lindelo perfect function. Also, we study the images and ¨ inverse images of certain bitopological properties under these functions. We derive some related results. Finally, some product theorems obtained concerning these concepts.

**Keywords:** bitopological space; p−Lindelo perfect function; S−Lindelo perfect function.

ALI ATOOM, HAMZA QOQAZEH, YOUSEF AL-QUDAH, ALI JARADAT, NABEELA ABU ALKISHIK (2021). PAIRWISE LINDELO PERFECT FUNCTIONS, Journal of Applied Mathematics and Informatics, (2021).