

## Summaries of articles published in this issue

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SUMMARIES OF ARTICLES PUBLISHED IN THIS ISSUE

(Publication of these summaries is permitted)

EKKEHARD KRÄTZEL, Jena: *Mittlere Darstellungen natürlicher Zahlen als Summe von  $n$   $k$ -ten Potenzen*. Czech. Math. J. 23(98), (1973), 57–73. (Originalartikel.)

Im Artikel ist ein neuer Beweis des Satzes von Randol ohne Einschränkung auf die Parität der Zahl  $k$  gegeben.

ALEXANDER DOKTOR, Praha: *Mixed problem for semilinear hyperbolic equation of second order with Dirichlet boundary condition*. Czech. Math. J. 23 (98), (1973), 95–122. (Original paper.)

In this paper the mixed problem of the Dirichlet type for one equation of the second order is considered. Let  $\Omega$  be a bounded domain in  $\mathbf{R}^n$ ,  $0 < T < +\infty$ , and let  $L$  be a linear differential operator on  $Q = \Omega \times (0, T)$  of the following form:  $L = (\partial^2/\partial t^2) + a_1(x, t; D) (\partial/\partial t) + a_2(x, t; D)$  where  $x \in \Omega$ ,  $t \in (0, T)$ ,  $a_1(x, t; D) = \sum_{i=1}^n h_i(x, t) (\partial/\partial x_i) + c_1(x, t)$ ,  $a_2(x, t; D) = - \sum_{i,j=1}^n (\partial/\partial x_i) (a_{ij}(x, t) (\partial/\partial x_j)) + \sum_{i=1}^n b_i(x, t) (\partial/\partial x_i) + c_2(x, t)$ . For this operator we shall consider the following problem: to find a function  $u$  satisfying the equation  $Lu = f(x, t, u, \partial u/\partial x_1, \dots, \partial u/\partial x_j, \partial u/\partial t)$ , the initial conditions  $u(x, 0) = u_0(x)$ ,  $(\partial u/\partial t)(x, 0) = u_1(x)$ ,  $x \in \Omega$  and the boundary condition  $u(x, t) = g(x, t)$ ,  $(x, t) \in \partial\Omega \times (0, T)$ , where  $\partial\Omega$  denotes the boundary of the domain  $\Omega$  and  $f, u_0, u_1, g$  are given functions.

KAMIL JOHN, Praha: *Some remarks on compact maps in Banach spaces*. Czech. Math. J. 23 (98), (1973), 177–182. (Original paper.)

A characterization of compact maps is given similar to that of quasi-nuclear maps. Other related characterizations are stated in terms of factorization or expression of maps as countable series. Every compact map is a product of two compact maps. An equivalence between certain "into" extension properties of compact maps and the possibility of their factorization through  $c_0$  or  $m$  is shown.

MILAN TVRDÝ, Praha: *Boundary value problems for linear generalized differential equations and their adjoints*. Czech. Math. J. 23 (98), (1973), 183 to 217. (Original paper.)

The paper deals with the integral boundary value problems involving generalized (in the sense of J. Kurzweil) linear integrodifferential equation  $dx/d\tau = D[A(t)x + C(t)x(a) + D(t)x(b) + \int_a^b [d_s G(t, s)] x(s) + f(t)]$ . In particular the adjoints are formulated and the corresponding Fredholm theorems are proved.

J. L. HURSCHE and A. VERBEEK, Amsterdam: *A class of connected spaces with many ramifications*. Czech. Math. J. 23 (98), (1973), 218–228. (Original paper.)

The subject of this note is the class of spaces, which have a point  $x_0$  such that every connected subset containing  $x_0$  is closed. The class of these spaces originated as a class of counterexamples in studying conditions equivalent to (weak) linear orderability of connected topological spaces.

SYED A. HUQ, Canberra: *A note on mutants in semigroups*. Czech. Math. J. 23 (98), (1973), 229–230. (Original paper.)

In this paper the author proves the following conjecture of Jin Bai Kim: Any semigroup  $S$  has no decomposition  $S = \bigcup_i M_i$  into a finite number of disjoint mutants  $M_i$  ( $i = 1, 2, \dots, n$ ) of  $S$ .

GEORGE ALEXANDER and CHARLES SWARTZ, Tucson: *Linear operators on  $c_X$* . Czech. Math. J. 23 (98), (1973), 231–234. (Original paper.)

I. Dobrakov has posed several problems for spaces of vector-valued continuous functions on a locally compact Hausdorff space  $S$ . In this note the authors show that some results of J. Batt on operator-valued series can be employed to solve two of these problems for the special case when  $S$  is the one-point compactification of the positive integers.

VĚRA POHLOVÁ, Praha: *On sums in generalized algebraic categories*. Czech. Math. J. 23 (98), (1973), 235–251. (Original paper.)

In this paper categories  $A(F, G)$  are studied which are a generalization of the categories of universal algebras.  $F$  and  $G$  are covariant functors from *Set* to itself. Objects of  $A(F, G)$  are couples  $(X, \omega_X)$  where  $X$  is a set and  $\omega_X : X \times X \rightarrow X$  is a mapping. Morphisms from  $(X, \omega_X)$  to  $(Y, \omega_Y)$  are such mappings  $f : X \rightarrow Y$  that  $f\omega_X = \omega_Y f$ . A necessary and sufficient condition for the functors  $F$  and  $G$  is given in this paper so that the category  $A(F, G)$  may have sums or finite sums.

NOBUAKI KUROKI, Funabasi: *Certain fundamental congruences on the tensor product of commutative inverse semigroups*. Czech. Math. J. 23 (98) (1973), 252–256. (Original paper.)

Two elements of a semigroup  $X$  are said to be  $\mathcal{L}$ -equivalent if they generate the same principal left ideal of  $X$ .  $\mathcal{R}$ -equivalence is defined dually. The join of the equivalences  $\mathcal{L}$  and  $\mathcal{R}$  is denoted by  $\mathcal{D}$  and their intersection by  $\mathcal{H}$ . By an inverse semigroup the author means a semigroup  $X$  in which to each element  $a$  there corresponds a unique element  $a^{-1}$  such that  $aa^{-1}a = a$  and  $a^{-1}aa^{-1} = a^{-1}$ . In this note the author proves that the tensor product of  $\mathcal{L}(\mathcal{R}, \mathcal{D}, \mathcal{H})$ -equivalences on commutative inverse semigroups  $X$  and  $Y$  is also  $\mathcal{L}(\mathcal{R}, \mathcal{D}, \mathcal{H})$ -equivalence on the tensor product  $X \otimes Y$ . Further the author considers the analogous properties of the minimum semilattice congruences and the maximum idempotent-separating congruences on a commutative inverse semigroup. A semigroup  $X$  is said to be fundamental if the only congruence on  $X$  contained in  $\mathcal{H}$  is the identity congruence. The author also proves that the tensor product of commutative inverse fundamental semigroups is fundamental.

KENNETH D. MAGILL Jr., Buffalo: *Connected CM-homomorphisms into  $\mathbb{C}[I]$* . Czech. Math. J. 23 (98), (1973), 257–268. (Original paper.)

A  $T_1$  topological space  $X$  is a  $\mathbb{C}$ -space if it has the property that the composition of any two closed relations on  $X$  is again a closed relation on  $X$ . The semigroup, under composition, of all closed relations on a  $\mathbb{C}$ -space  $X$  is denoted by  $\mathbb{C}[X]$ . The author is studying the connected CM-homomorphisms  $\mathbb{C}[X] \rightarrow \mathbb{C}[Y]$ , i.e. the homomorphisms which preserve unions, take symmetric relations into symmetric relations, do not map everything onto a single element and take connected relations into connected relations. The main result is the proof that connected CM-homomorphism  $\mathbb{C}[X] \rightarrow \mathbb{C}[I]$  ( $I$  is the unit interval) exists only if  $X$  is a compact subspace of an interval.

HANA PETZELTOVÁ, Praha: *Periodic solutions of the equation  $u_{tt} + u_{xxxx} = ef(\cdot, \cdot, u, u_t)$* . Czech. Math. J. 23 (98), (1973), 269–285. (Original paper.)

The purpose of this paper is to prove the existence of  $2\pi$ -periodic solutions of the equation  $Lu \equiv u_{tt} + u_{xxxx} = ef(\cdot, \cdot, u, u_t)$   $u(t, 0) = u_{xx}(t, 0) = u(t, \pi) = u_{xx}(t, \pi) = 0$  under the assumption that  $f$  is  $2\pi$ -periodic in  $t$ .

JAROSLAV KURZWEIL, Praha: *On Fubini theorem for general Perron integral*. Czech. Math. J. 23 (98), (1973), 286–297. (Original paper.)

The approximation by means of integral sums (which is analogous to the usual approach to the Riemann integral) is used to obtain Fubini theorem for the Perron integral in a general form; necessary and sufficient conditions for the existence of the iterated integral are found.

MIROSLAV FIEDLER, Praha: *Algebraic connectivity of graphs*. Czech. Math. J. 23 (98), (1973), 298–305. (Original paper.)

For any finite non-directed graph, a number called algebraic connectivity is defined and its relations to the usual edge and vertex connectivities are investigated.

ALOIS ŠVEC, Praha: *On transitive submanifolds of  $\mathcal{C}^2$  and  $\mathcal{C}^3$* . Czech. Math. J. 23 (98), (1973), 306–338. (Original paper.)

The purpose of this paper is the study of real hypersurfaces of  $\mathcal{C}^2$  which are transitive under the pseudogroup of biholomorphic transformations with the absolute value of the jacobian equal to one.

ALOIS ŠVEC, Praha: *Surfaces in hermitian 3-spaces*. Czech. Math. J. 23 (98), (1973), 339–344. (Original paper.)

The purpose of the paper is to obtain an invariant field of frames associated to a surface in the hermitian 3-space.