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M. K. Aouf

CERTAIN SUBCLASSES OF MEROMORPHICALLY MULTIVALENT  
FUNCTIONS ASSOCIATED WITH A CERTAIN LINEAR OPERATOR 1-30

**Abstract:** Making use of certain linear operator, we introduce two novel subclasses  $Q_n(p, \alpha; A, B)$  and  $Q_n^+(p, \alpha; A, B)$  of meromorphically multivalent functions of order  $\alpha$  ( $0 \leq \alpha < p$ ) in the punctured disc  $U^*$ . In this paper we investigate the various important properties and characteristics of these subclasses of meromorphically multivalent functions. We extend the familiar concept of neighborhoods of analytic functions to these subclasses of meromorphically multivalent functions. We also derive many interesting results for the Hadamard products of functions belonging to the class  $Q_n^+(p, \alpha; A, B)$ .

Rabindra Nath Mondal, Md. Sharif Uddin, Md. Ali Akbar  
and Bichakshan Mondal

NUMERICAL STUDY OF DEAN VORTICES AND UNSTEADY SOLUTIONS  
THROUGH A CURVED SQUARE DUCT FLOW 31-56

**Abstract:** In this paper, flow instability in a curved duct with square cross section is studied numerically by using a spectral method, and covering a wide range of the Dean number  $0 \leq Dn \leq 5000$  for the curvature  $\delta = 0.1$ . A temperature difference is applied across the vertical sidewalls for the Grashof number  $Gr = 100$ ,

where the outer wall is heated and the inner wall cooled. After a comprehensive survey over the parametric ranges, two branches of asymmetric steady solutions with two- and four-vortex solutions are obtained by the Newton-Raphson iteration method. Linear stability of the steady solutions is then investigated. It is found that only the first branch is linearly stable in a couple of interval of  $Dn$ , while the other branch is linearly unstable. Steady values of the Nusselt numbers,  $Nu$ , are also calculated for two differentially heated vertical sidewalls. When there is no stable steady solution, time evolutions of  $Nu$  as well as their phase spaces are obtained, and it is found that in the unstable region the flow undergoes in the scenario “*steady*  $\rightarrow$  *periodic*  $\rightarrow$  *multi-periodic*  $\rightarrow$  *chaotic*”, if the Dean number is increased.

**T. Ram Reddy and R. B. Sharma**

A COEFFICIENT INEQUALITY FOR CERTAIN SUBCLASSES OF  
ANALYTIC FUNCTIONS

57-70

**Abstract:** The aim of the present paper is to introduce a new subclass of analytic functions of complex order and to obtain the Fekete-Szego inequality for the functions in this class. The Fekete-Szego inequality for the inverse function of  $f$  in this class is also obtained. Certain applications of our results for the functions defined through convolution are also obtained.

**Deepa Sinha and Pravin Garg**

BALANCE AND CONSISTENCY OF TOTAL SIGNED GRAPHS

71-81

**Abstract:** A *signed graph* (or *sigraph* in short) is an ordered pair  $S = (S^u, \sigma)$ , where  $S^u$  is a graph  $G = (V, E)$ , called the underlying graph of  $S$  and  $\sigma : E \rightarrow \{+, -\}$  is a function from the edge set  $E$  of  $S^u$  into the set  $\{+, -\}$ , called the *signature* (or *sign*

in short) of  $S$ . In this paper, first we define *total sigraph* of a given sigraph and then obtain the following theorems:

**THEOREM 4.** *The total sigraph  $T(S)$  of a sigraph  $S$  is balanced if and only if  $S$  is a negatively odd-even sigraph.*

**THEOREM 13.** *The total sigraph  $T(S)$  of a sigraph  $S$  is  $\mu_1$ -consistent if and only if  $S$  is an all-positive sigraph.*

### **M. Alhaz Uddin, M. Abdus Sattar and M. Shamsul Alam**

AN APPROXIMATE TECHNIQUE FOR SOLVING STRONGLY  
NONLINEAR DIFFERENTIAL SYSTEM WITH DAMPING EFFECTS 83-98

**Abstract:** Based on He's homotopy perturbation technique and the extended Krylov-Bogoliubov-Mitropolskii (KBM) method, an approximate solution is obtained for second order strongly nonlinear ordinary differential system with small damping effects. The method has been illustrated by an example.

### **Sujoy Chakraborty and Akhil Chandra Paul**

ON JORDAN  $k$ -ISOMORPHISMS OF CERTAIN  $\Gamma_N$ -RINGS 99-111

**Abstract:** In this paper, we first define  $k$ -isomorphism, anti- $k$ -isomorphism and Jordan  $k$ -isomorphism of Nobusawa gamma rings and then develop some useful consequences to prove that every Jordan  $k$ -isomorphism of a Nobusawa gamma ring onto a 2-torsion free prime Nobusawa gamma ring is either a  $k$ -isomorphism or an anti- $k$ -isomorphism. Next we are to show that the similar result is also true if we consider a 2-torsion free completely prime Nobusawa gamma ring instead of a 2-torsion free prime Nobusawa gamma ring.

**Kazuo Kuroki and Shigeyoshi Owa**

NOTES ON THE JANOWSKI FUNCTIONS DEFINED BY SOME  
COMPLEX PARAMETERS

113-123

**Abstract:** For the Janowski functions which have been investigated by W. Janowski (Ann. Polon. Math. **23**(1970), 159-177), an extension of some subordinations for the Janowski functions is given, and the Janowski functions defined by some complex parameters are also discussed.

**Marcelo F. Farias and Dinamérico P. Pombo Jr.**

A UNIVERSAL PROPERTY OF BORNLOGICAL MODULES AND  
TOPOLOGICAL MODULES OF MULTILINEAR MAPPINGS

125-161

**Abstract:** In this work we prove that certain bornological modules of multilinear mappings are isomorphic to bornological projective limits of bornological modules of multilinear mappings and that certain topological modules of multilinear mappings are isomorphic to topological projective limits of topological modules of multilinear mappings.

**M. K. Aouf**

THE QUASI-HADAMARD PRODUCTS OF CERTAIN ANALYTIC  
FUNCTIONS WITH NEGATIVE COEFFICIENTS

163-184

**Abstract:** Two subclasses  $T_n^*(p, \alpha, \beta)$  and  $C_n(p, \alpha, \beta)$  of certain analytic functions with negative coefficients in the open unit disc are introduced. In this paper, we give some interesting results involving the quasi-Hadamard product of functions belonging to the above subclasses. All of our results are sharp and our results

are the generalizations of earlier results given by Schild and Silverman [17], Owa [12], Salagean [16] and Patel and Acharya [15], and provide the improvements in the previous results obtained by Owa [13] and Patel and Acharya [15].

**Peter Danchev**

ON SOME PROPERTIES OF SOCLE-REGULAR AND STRONGLY  
SOCLE-REGULAR ABELIAN  $p$ -GROUPS

185-193

**Abstract:** Several assertions concerning socle-regularity and strong socle-regularity are proved. They continue early results in this subject due to the author and Brendan Goldsmith published in Arch. Math. (2009), J. Algebra (2010) and J. Comm. Algebra (2011).

**Rui-Xiang Gu, Bin Huang and Hui Huang**

ON THE COMPLEX OSCILLATION OF A CERTAIN DIFFERENTIAL  
EQUATION

195-213

**Abstract:** In this paper, we investigate the growth of solutions of a certain second order homogenous linear differential equation with the form  $f'' + (A_1e^{az} + A_2e^{cz})f' + A_0e^{bz}f = 0$  and its non-homogenous form, we obtain the sharp estimation of the order and the hyper-order of the solutions of the equations which improve the results of Chen, Cheng and Zhou in the references of [5], [6] and [10].