

GENERALIZED QUASILINEARIZATION OF MDE FOR PBVP THROUGH COUPLED LOWER AND UPPER SOLUTIONS OF THE IVP

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Abstract. In this paper, we first develop the method of generalized quasilinearization technique for initial value problem of Matrix Differential Equation (MDE) by using coupled lower and upper solution of Type I and use it to develop quasilinearization for PBVP of the MDE and prove the existence of a unique solution under certain criteria. In order to develop the method of quasilinearization in this set up, we fix either the lower solution or the upper solution.

Keywords: Matrix differential equation, coupled lower and upper solutions, existence of a solution, uniqueness, Periodic boundary value problem, Quasilinearization technique.

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1 Introduction

Matrix differential equations play a crucial role in various fields, including engineering, control systems, physics, biology, medicine, finance, ecology, and mechanical systems. The qualitative theory of matrix differential equations deals with existence and uniqueness of solutions, stability of solutions etc. The existence and uniqueness solutions of MDE are studied using various approaches like fixed point theory and iterative techniques. The monotone iterative technique and quasilinearization are two iterative techniques that are widely used to obtain existence and uniqueness solutions of various types of differential equations. In [1,2,3,4] using these techniques and combined with method of upper and lower solutions that provide existence result in a closed sector generated by the lower and the upper solutions in this problem. In [5,6] monotone iterative technique for PBVP was developed by constructing monotone sequences, which are solutions of IVPs of linear differential equations.

It has been observed that if any coupled lower and upper solutions of Type I are available then in order to construct the sequence of iterates for