SOLUTION OF A MIXED PROBLEM
WITH PERIODIC BOUNDARY
CONDITION FOR A QUASI-LINEAR
EULER-BERNOULLI EQUATION

H. Halilov∗†, K. Kutlu∗, B. Ö. Güler∗

Received 04:02:2010 : Accepted 22:02:2010

Abstract

In this paper, the existence and uniqueness of the weak generalized solution of a mixed problem with periodic boundary condition for a quasi-linear Euler-Bernoulli equation are examined, and an estimation of the differences between the exact and approximate solution is obtained. In order to solve the problem, first the test functions are given, then the weak generalized solution of the problem is defined in terms of these functions. The weak solution is expressed as a Fourier series with undetermined variable coefficients, and a system of non-linear infinite integral equations for the coefficients mentioned above is obtained. The existence and uniqueness of the solution of the system are proved by the successive approximation method on the Banach space $B_T$. Finally, in view of the practical importance of the problem, the norm of the difference between the exact solution and successive approximations of the infinite system is estimated on the space $B_T$.

Keywords: Partial derivative, Periodic boundary condition, Quasi-linear, Mixed problem, Euler-Bernoulli equation, Fourier method, Non-linear infinite integral equations.

2000 AMS Classification: 35 K 55, 35 K 70.

∗Rize University, Faculty of Science and Letters, Department of Mathematics, 53050 Rize, Turkey. E-mail: (H. Halilov) huseyn.halilov@rize.edu.tr (K. Kutlu) kkutlu@ttmail.com (B. Ö. Güler) bahadir.guler@rize.edu.tr
†Corresponding Author.