ABSTRACT

Structural optimization deals with the efficient design of structures. Efficiency implies minimum cost or minimum weight while satisfying a variety of strength and stiffness requirements. In all engineering problems, designers try to find solutions giving good performance, which satisfy several requirements. Using optimization techniques, engineers can obtain the optimum, within the imposed conditions. Structures designed in this way are safer, more reliable and less expensive than the traditional designs.

The application of Structural optimization approach to Bridge system is presented in this thesis. The bridge system consists of deck, beam, abutment, wing wall and pier. The objective function of the optimization problem is the cost (volume) of the every component. Reduced Gradient method is used during the structural optimization process. To design optimized bridge system, software was developed. It will be use with knowledge of bridge designing.

This thesis describes how *MSExcel* is utilized to organize, manage, direct for solving and optimizing bridge components. It is easy to learn and user-friendly software. To evaluate the stress and deflection *SAP2000* was used. Today's engineering structures are often analyzed using the finite element method (*FEM*). Numerical design optimization provides the designer with a computational tool that finds the best design, based on predefined performance requirements. The optimizer automatically makes changes to problem parameters that are allowed to vary, referred to as design variables, perform a new analysis (linear or non-linear) to evaluate the influence of the changes and repeat the process until the design that best satisfies the performance requirement is found. After that

bridge components were modeled using *SAP2000*. Actually, it is used for checking the stress and deflection. Compared the optimized results with manual design results, the optimized results are economical than the manual design results.