Abstract

The present research is concerned with the development of a procedure and an accompanying computer program for analysis by finite prism element and shape optimization of straight box girder under arbitrary static loads, "*Non- linear programing techniques of Hook and Jeeves method"* is adopted to find the optimum shape of the box girder, considering the weight or stress as an objective function and geometric configuration of the problem (shape or dimensions) as design variables.

The displacement field in the finite prism element approaches can be expressed as a product of two-dimensional polynomial shape functions in typical plane of the structure and suitable Fourier expansion in the third (perpendicular) direction. The load is being expanded in terms of Fourier series along the third direction.

It has been proved that the finite prism method offers an accurate and inexpensive tool for the optimization of box girder bridges having regular optimization prismatic-type geometry.

A parametric study was performed regarding the slope of external webs, thickness of top and bottom slabs, thickness of webs, depth of beam, cantilever distance and distance between webs, using Hook and Jeeves method, these are shown in the results of the study.

The result obtained from this study showed that the weight and deviatoric stress minimization were more sensitive to the changes in the top slab thickness compared to the other parameters. The maximum stress decreases (70.8) percentage when the thickness of the top slab increases from (0.075m) to (0.15m). The weight increases almost linearly with increasing thickness approximately to about (3515 kN/m).