ENGLISH SUMMARY

STRUCTURAL DESIGN AND OPTIMIZATION

Risto Sajaniemi

Rakenteiden Mekaniikka 1 (1968) pp. 44 to 52

Firstly there is indicated in the article that the creating structural design has to be optimization or the searching of the best possible solution. Different objects of optimization, the factors affecting on them and problems appearing in practice are then examined. For solving the problems several methods are given, the best of which as a matter of fact begin a new period in the history of structural optimization. Finally the article is illustrated by two examples, the first of which is a computer made cost optimization of a liquid tank and the second a weight basis optimization of a portal frame describing the possibilities of linear programming.

SIMULTANEOUSLY COMPRESSED AND BENDED UNIFORM AND BUILT-UP STRUTS.

Jaakko Laine

Rakenteiden Mekaniikka 1 (1968) pp. 53 to 59

The common design methods of compressed and simultaneously bended uniform struts have been referred. By taking into account the increasing effect of shear forces on deflections the same formulas have been derived in some loadcases also for built-up struts.

The accuracy of design methods has been checked by some tests made with aluminium alloy rods and with latticed aluminium alloy and steel struts.

The results of the tests with rods show that the theoretical design methods give values which are on the safer side.

The tests with bolted latticed struts show that the effect of deflections in bolted joints on test results is remarkable. These deflections may be six times so large as the elastic deformations of bracing members (hole 1 mm larger than bolt shaft). The effect of deflections in joints can easily be included into the design formulas, but the estimation of their values in different joints is difficult.

INTERPRETATIONS OF TWO INTEGRATION FORMULAE BY USING THE CONCEPTS OF THE THEORY OF STRUCTURES

Eero-Matti Salonen

Rakenteiden Mekaniikka 1 (1968) pp. 60 to 63

The paper presents two formulae ((10) and (18)) for numerical integration derived by employing well-known concepts of the theory of structures. The formulae are of form where certain correction terms are added to the result by the trapezoidal rule (A_{tr}). Formula (10) is arrived at by transforming the total loading of a beam into pointloads by letting the loading act indirectly and by replacing the intensity of the loading piecewise by second degree polynomials. Formulae (18) is derived by replacing the function to be integrated by the deflection curve of a beam. The accuracy of formula (18) is often good already when the number of subintervals is only one or two. However the use of the formula is restricted by the fact that the derivatives of the function to be integrated are not always known in the endpoints of the interval. Both formulae give correct values for polynomials of the third or lower degree. The formulae are valid contrary to Simpson's rule also when the number of the subintervals is odd. Results of an application are presented in table 1.

ON STRUCTURAL VIBRATIONS

Pentti Loikkanen

Rakenteiden Mekaniikka 1 (1968) pp. 64 to 72

Structures of lumped-mass systems are treated only. At first structures with one degree of freedom are handled to recall the equations of harmonic vibrations and to introduce the notation. Results are then generalized to multidegree-of-freedom systems.

Objects of discussion are undamped free vibrations, undamped response to arbitrary external forces and to motion of support restraints. They are followed by the damping effect, its significance and taking into consideration. Presentation and derivation of equations emplays matrix notations to facilitate performing calculations with digital computer.