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MAE 290A, Fall 2019

HW1 Writeup

1. Michell Truss 4th order

    a) The structure is not potentially inconsistent nor undetermined. In other words, the structure is statically determined with exactly one solution for a given condition (external load). Mathematically, matrix A_se of the system (A_se)x = b is invertible with row = column = its rank.

2. 4-bar non-minimal prism

    a) The structure is potentially inconsistent. It results from the fact that some rows of matrix A_se of the system (A_se)x = b are linearly dependent on the other rows. It might have either no solution or many solution depending on the given condition (external load).

    b) The structure is undetermined.

        i. It results from the fact that there are fewer independent equations than unknowns. Or in linear algebra perspective, columns of matrix A_se are not linearly independent, thus not invertible. Therefore, there are infinitely many solutions. Physically, the undeterminance is caused by the non-minimal nature of the structure.

        ii. It is not pretensionable, but tensionable under load. The structure can not be pretensioned such that there is a realizable solution (statically equilibrium and tension on all strings) even if there is no external load. However, for given condition (external load) such as opposite and outward force on both the upper and lower plane of the structure, it is tensionable and has a realizable solution.