2.1 MULLER BRESLAU'S PRINCIPLE

Introduction

The analysis of determinate structure is what discussed in the previous unit and it is evident that influence line diagrams play a key role in it. But there are also beam such as fixed beams, continuous beams and propped cantilever that are hard to analyze by using equilibrium equations. Such structures are called indeterminate structure and they can be determined by various deformations and by application of compatibility condition.

Influence line on such structures could be improvised based on principle suggested by Muller-Breslau which is based on Maxwell's theorem of reciprocal displacement. The benefits of such principle and the analysis in indeterminate structure is the main matter of this unit..

Muller-Breslau principle.

Muller-Breslau principle states that, if we want to sketch the influence line for any force quantity (like thrust, shear, reaction, support moment or bending moment) in a structure,

(i) We remove from the structure the resistant to that force quantity

(ii) We apply on the remaining structure a unit displacement corresponding to that force quantity. The resulting displacements in the structure are the influence line ordinates sought

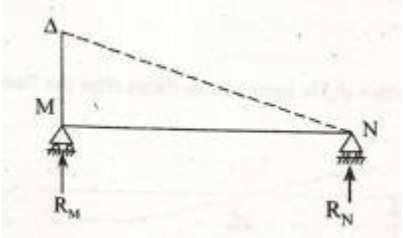

Fig. 2.1.1

Statement

If an internal stress component like shear force, bending moment etc, or a reaction component is allowed to act through a small distance thereby causing deformation of the structure, the curve of the deformed shape represents to some scale, the influence lines for that stress or the reaction component.

State Maxwell-Betti's theorem.

In a linearly elastic structure in static equilibrium acted upon by either of two systems of external forces, the virtual work done by the first system of forces in undergoing the displacements caused by the second system of forces is equal to the virtual work done by the second system of forces in undergoing the displacements caused by the first system of forces.