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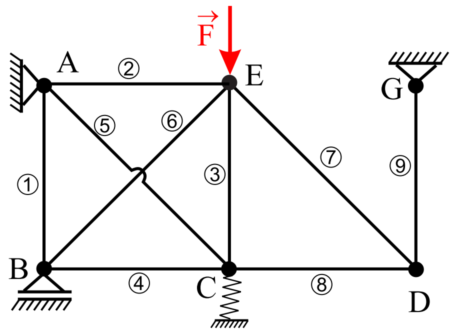
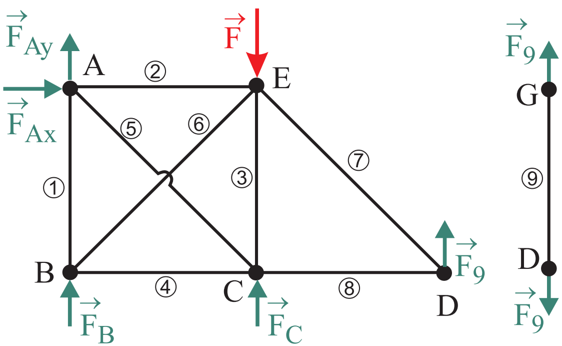
framework
loading
tension

Description: A system of 9 straight bars. The bars 1 to 8 are joint with at least one other bar on both of their ends (this is not the case of the bar No. 9, therefore this bar is not comprised in the plane framework created by the other bars) and the whole system is supported by the base and by the bar No. 9 (supported by another pin support in point G). All the joints among the bars 1 to 8 can be modelled as pin supports, the external load acts in the joint E ⇒ the system meet the assumptions of an immovable plane framework, supported by the base and by the bar No. 9.



Isolation of the system as free bodies:



The bar No. 9 is loaded only by forces in points D and G. Two forces are in statical equilibrium if they act on the same line and are equal in magnitude and opposite in orientation. Thus the bar No. 9 can be isolated as a free body using two forces $\vec{F}_D$ and $\vec{F}_G$ (their magnitude equals to F_9 and they are oriented in the mutually opposite directions). In the joint D of the framework, an opposite (equal in magnitude) force $\vec{F}_9$ is acting (principle of action and reaction).

Statical analysis of the plane framework:

the necessary condition of the external statical determinateness: $\nu = \mu_{ex}$
$s_{ext} = \mu_{ex} - \nu = 5 - 3 = 2 \quad \Rightarrow$ the problem is externally twofold statically indeterminate.

the necessary condition of the internal statical determinateness: $2k - 3 = p$
$s_{int} = p - (2k - 3) = 8 - (2 \cdot 5 - 3) = 1 \quad \Rightarrow$ problem is internally onefold statically indeterminate.

The problem is twofold externally statically indeterminate and onefold internally statically indeterminate.