

Example 3.2.2 – A pin jointed frame, $ABCDE$ carries a horizontal load of 10 kN at D as shown in Figure 1. The pinned joints A , B and C are fixed to a rigid base. The cross-sectional area of each member is 200 mm^2 and the material is steel for which Young's modulus is 200 GPa.

- State whether or not the truss is statically determinate and the degree of redundancy.
- Calculate the loads carried by each of the members.
- Calculate the horizontal deflection at D .
- State briefly how you would go about finding the horizontal deflection at E (no calculations are required for this case).

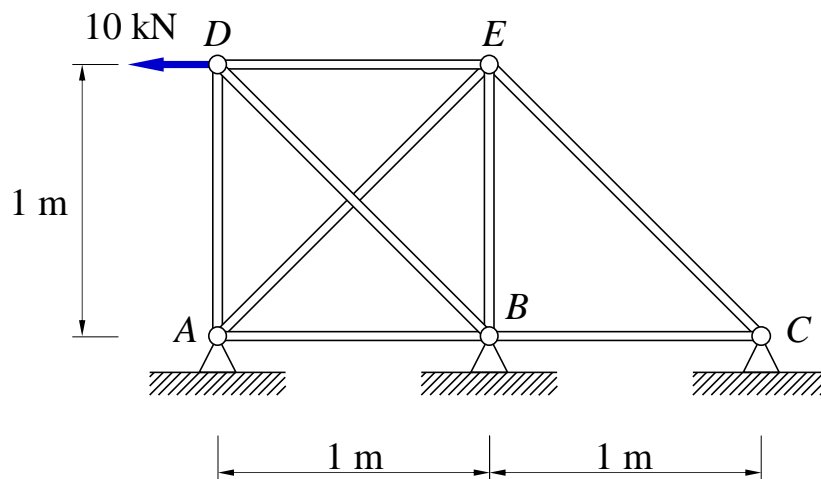


Figure 1: A plane pin-jointed truss structure.

Table 1: Application of the PSPE.

Member	Force F_i [kN]	Length L_i [m]	$A_i E_i$ [kN]	$\frac{\partial F_i}{\partial X}$	$\frac{\partial F_i}{\partial Y}$	$F_i L_i \frac{\partial F_i}{\partial X}$ [kN·m]	$F_i L_i \frac{\partial F_i}{\partial Y}$ [kN·m]
<i>AD</i>							
<i>AE</i>							
<i>BD</i>							
<i>BE</i>							
<i>CE</i>							
<i>DE</i>							
						$\Sigma/AE = 0$	$\Sigma/AE = 0$

Table 2: Application of Castigliano's 2nd theorem.

Member	Force F_i [kN]	Length L_i [m]	$A_i E_i$ [kN]	$\frac{\partial F_i}{\partial Q}$	$F_i L_i \frac{\partial F_i}{\partial Q}$ [kN·m]
<i>AD</i>					
<i>AE</i>					
<i>BD</i>					
<i>BE</i>					
<i>CE</i>					
<i>DE</i>					
					$\Sigma/AE = u_D$