# Example 1-a

Classify each of the trusses as stable, unstable, statically determinate or statically indeterminate. The trusses are subjected to arbitrary external loadings that are assumed to be known & can act anywhere on the trusses.

(a)

Externally stable

Reactions are not concurrent or parallel

$b = 19,\ r = 3,\ j = 11$

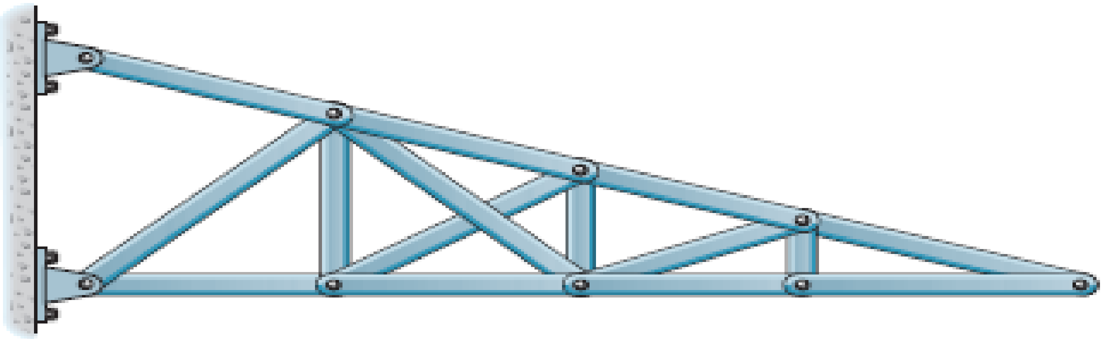
$b + r = 2j = 22$

Truss is statically determinate

By inspection, the truss is internally stable

# Example 1-b

## Solution



(b)

Externally stable

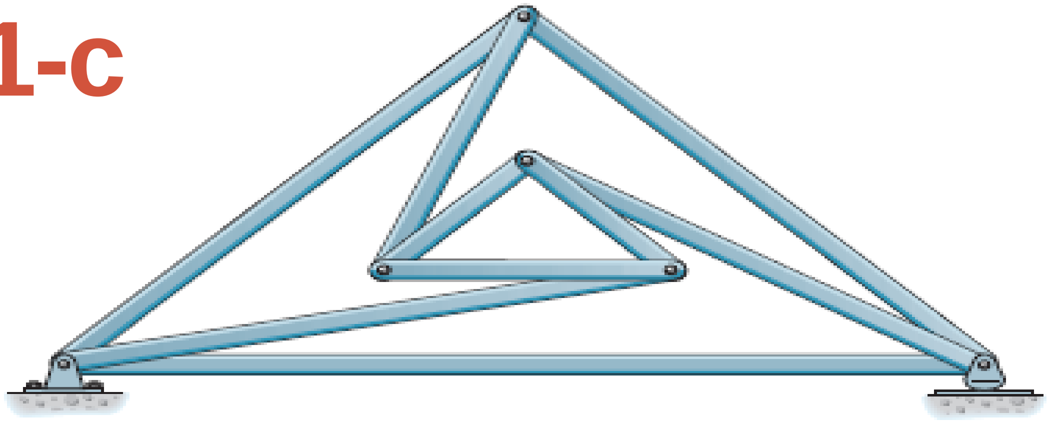
b = 15, r = 4, j = 9

b + r = 19 >2j

Truss is statically indeterminate

By inspection, the truss is internally stable

# Example 1-c



(c)

## Solution

Externally stable

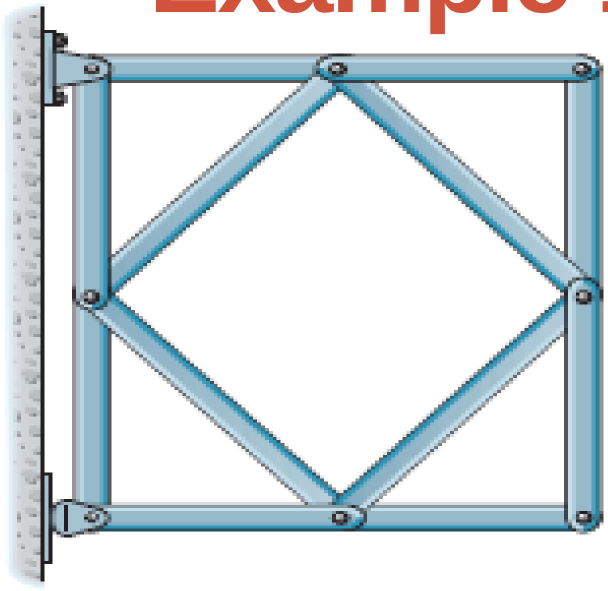
$b = 9, r = 3, j = 6$

$b + r = 12 = 2j$

Truss is statically determinate

By inspection, the truss is internally stable

# Example 1-d



(d)

## Solution

Externally stable

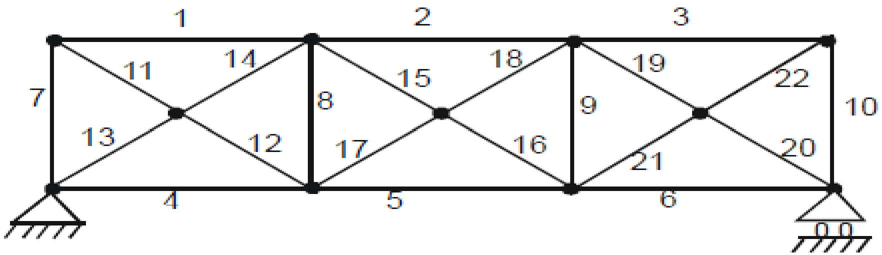
b = 12, r = 3, j = 8

b + r = 15 < 2j

The truss is internally unstable

# Examples on Determinacy and Stability

Example -1-




**(i) External Stability and Determinacy:-**

Number of reactions = 3

Number of equations = 3

D = 3 - 3 = 0

So, Externally Stable and Determinate

**ii) Internal Stability and Determinacy:-**

b = 22; r = 3; j = 11

b + r = 2j

D = ( b+ r ) - 2j

= ( 22 + 3 ) - ( 2 X 11 )

= 25 - 22

D = 3 where D = Degree of indeterminacy.

So, Stable and indeterminate to 3rd degree.

# Example -2-

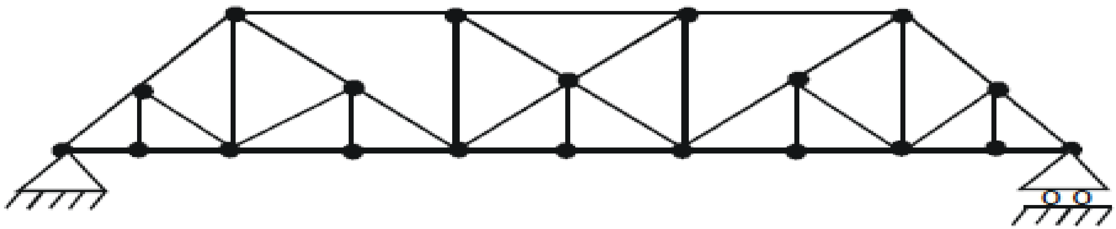


Fig. 1.18.

**(i) External Stability and Determinacy :-**

Number of reactions = 3

Number of equations = 3

D = 3 – 3 = 0

∴ Stable and Determinate.

**(ii) Internal Stability and Determinacy :-**

b = 38

r = 3

j = 20

$D = (b + r) - 2j$

$= (38 + 3) - 2 \times 20$

$= 41 - 40$

$D = 1$

∴ Stable and indeterminate to Ist degree.

# Example -3-

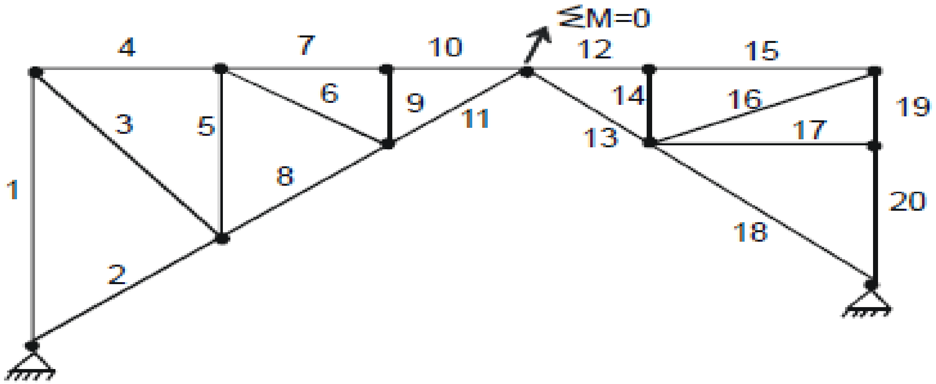



Fig. 1.24.

**(i) External Stability and Determinacy :-**

Number of reactions = 4

Number of equations = 3 + 1 = 4

D = 4 – 4 = 0

∴ Stable and Determinate.

**(ii) Internal Stability and Determinacy :-**

b = 20

r = 4 (Note this. A roller at either support will create instability)

j = 12

$(b + r) = 2j$

$(20 + 4) = 2 \times 12$

24 = 24

D = 24 – 24 = 0

(Here minimum r is 4 for internal stability and determinacy.)

∴ **Stable and determinate.**

# Example -4-

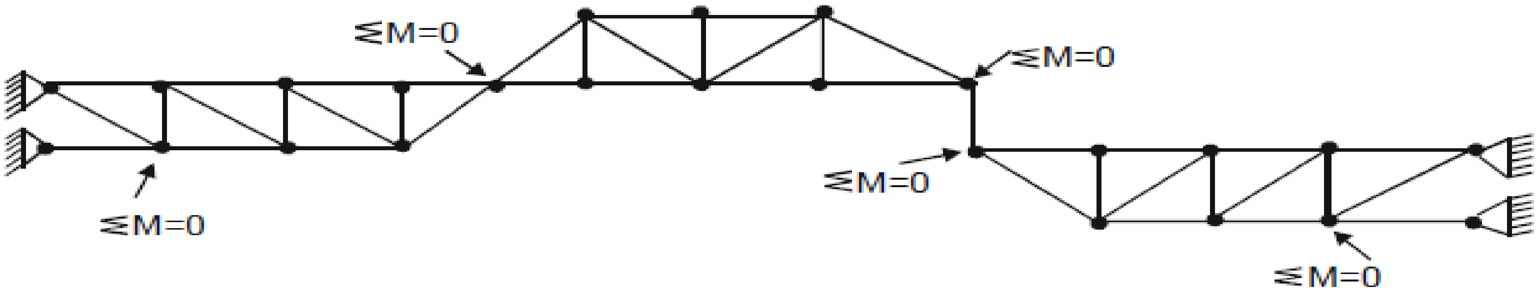



Fig. 1.26.

**(i) External Stability and Determinacy :-**

Number of reactions = 8

Number of equations = 8 = (3 + 5)

D = 8 – 8 = 0

∴ Stable and Determinate.

**(ii) Internal Stability and Determinacy :-**

b = 42

r = 3 + 5 = 8. There are 5 joints where $\Sigma M = 0$

j = 25

$b + r = 2j$

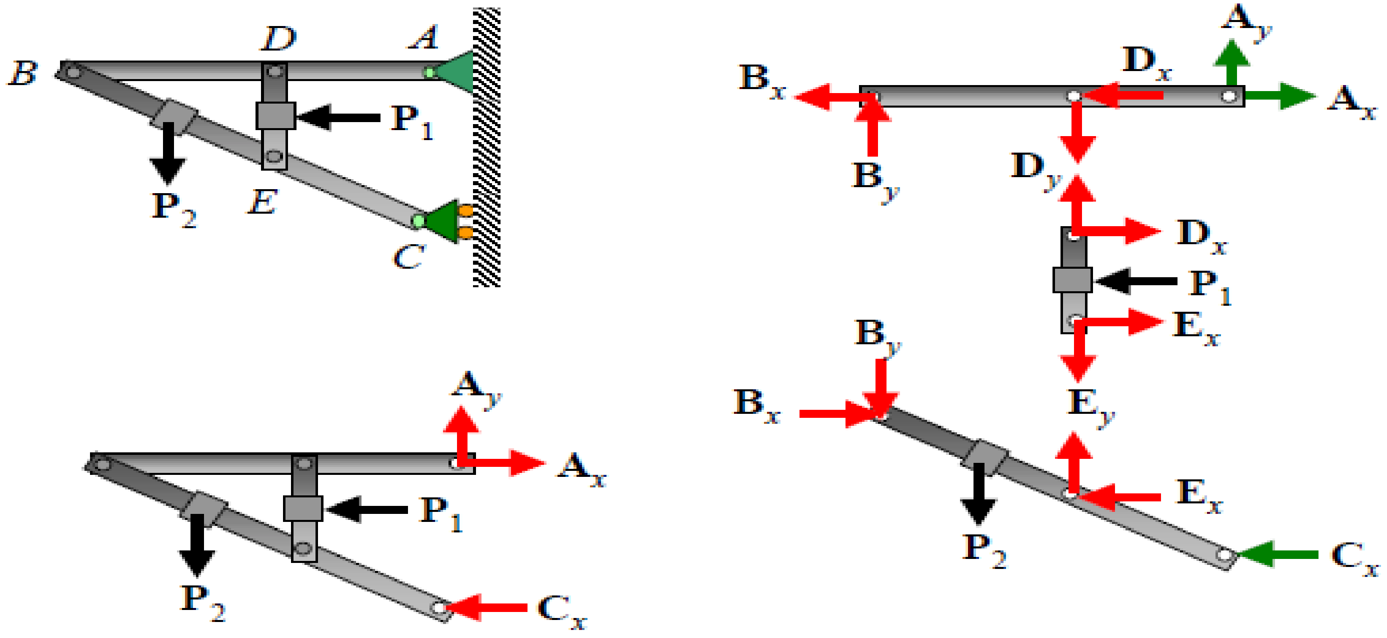
$42 + 8 = 2 \times 25$

$50 = 50$

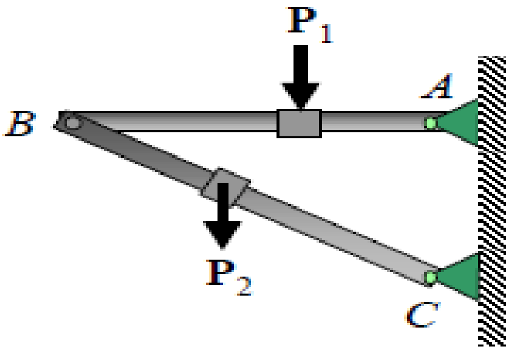
$D = 50 - 50 = 0$

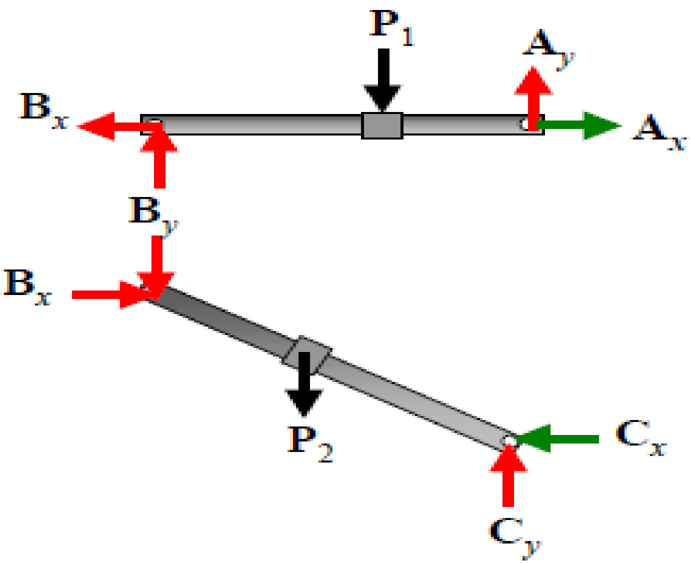
∴ Stable and Determinate.

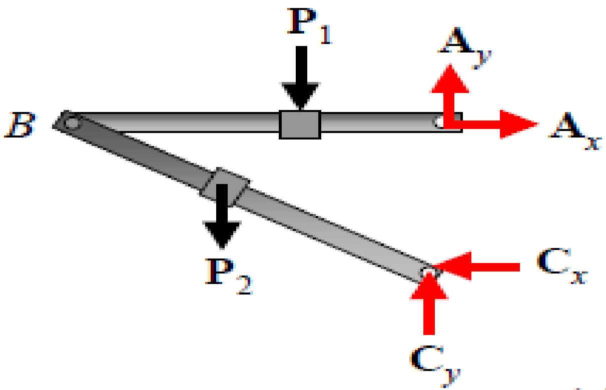
# Application of Equal. EQs




$r = 9,\ n = 3,\ 9 = 3(3);$ statically **determinate**




$r = 6,\ n = 2,\ 6 = 3(2);$ statically **determinate**