Stability and Determinacy of Frames:

If \( (r) \) is the number of reactions in a frame, 

\( (b) \): the number of members, 

\( (j) \): the number of joints, 

\( (c) \): the number of additional equations.

Then, the frame is said to be:

1. Unstable, if \( (3b + r) < (3j + c) \)
2. Statically determinate (If stable), if \( (3b + r) = (3j + c) \)
3. Statically indeterminate (If stable), if \( (3b + r) > (3j + c) \)

Also, the degree of indeterminacy \( (m) \) can be found as follows:

\[
m = (3b + r) - (3j + c) \quad \ldots \ldots \ldots \ldots \ldots \ldots . (1)
\]

**Useful Notes:**

1. The same rules used in beams for stability check are applied here in frames. 
2. If there are more than two members connected by an internal hinge, the total number of additional equations \( (c) \) can be determined using the equation below:

\[
C = \text{No. of members connected to the internal hinge} - 1 \quad \ldots \ldots \ldots \ldots \ldots \ldots . (2)
\]

3. Cantilevers should not be considered as members.
Solved Problems:
Check the stability and determinacy of the following frames

\[ b = 10, r = 9, j = 9, c = 0 \]
\[ (3b + r) = 39 \]
\[ (3j + c) = 27 \]
Stable
\[ m = 39 - 27 = 12 \]
Indeterminate to 12\(^{th}\) degree

Unstable:
Horizontal movement of segment AB

\[ b = 10, r = 9, j = 9, c = 3 \]
\[ (3b + r) = 39 \]
\[ (3j + c) = 30 \]
Stable
\[ m = 39 - 30 = 9 \]
Indeterminate to 9\(^{th}\) degree

\[ b = 4, r = 6, j = 4, c = 0 \]
\[ (3b + r) = 18 \]
\[ (3j + c) = 12 \]
Stable
\[ m = 18 - 12 = 6 \]
Indeterminate to 6\(^{th}\) degree
Class work: Problems p. 70-71 Hibbeler