

Question 4

Q: What is the relationship between the maximum value of principal stress and the maximum value of maximum principal stress and between the minimum value of principal stress and the minimum value of the minimum principal stress?

How about strain?

A: They generally have the relationship as follows.

Maximum value of principal stress \doteq Maximum value of maximum principal stress

Minimum value of principal stress \doteq Minimum value of minimum principal stress

The principal stress in vectors determines the maximum and minimum values from values at the center of gravity of each element. The maximum principal stress and minimum principal stress in contours determine the maximum and minimum values from values at the nodes of each element. Therefore, there may be discrepancies between the maximum values of principal stress and maximum principal stress, and between the minimum values of principal stress and minimum principal stress. The closeness of the gravity point to the nodes depends on the size of each element. Smaller elements result in a smaller distance between these points, reducing differences between respective maximum values and between respective minimum values.

In cases where second-order elements are used, stress is distributed within each element. The principal stress is represented at the center of gravity of an element, while the maximum and minimum principal stresses are interpolated and represented within the element. This means that the maximum value of maximum principal stress can exceed the maximum value of principal stress, and the minimum value of minimum principal stress can be lower than the minimum value of principal stress.

Therefore, it is recommended to consider both maximum principal stress and minimum principal stress.

Strain also follows the explanation above.