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## STRUCTURAL MECHANICS

### FINITE ELEMENT ANALYSIS OF CRACKED BEAMS INNOVATIVE WEAK FORM EQUATIONS

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#### **Abstract:**

In this paper a governing differential equation for the free vibration of cracked beam is derived. Using this equation the closed form solution is obtained and is used to verify the governing equation. The finite element formulation commences with the weak form equation. The conventional method of weighted residual is used to derive the weak form equation. Based on the physics of the proposed innovative model the correct weak form equation is derived. A beam with classical boundary condition to verify the accuracy, efficiency and robustness of the proposed method is analysed. It is shown that when the derivatives of the Dirac delta distribution appears in a differential equation the corresponding weak form equation cannot be obtained by the conventional method of weighted residual. The proposed method equally applies to the free vibration of cracked bars, stability and dynamic stability of cracked beams.

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