53:134 Structural Design II (Steel Structures)

Spring 2006 (Lecture Summary)

Week 7 (2/27 – 3/3/06)

2/27/06

- Review of direct stiffness method for springs – discuss basic steps. Solution of HW#11: 6.2.1.
- **Truss Analysis**:
  - Element equilibrium equation in the local coordinate system.
  - Transformations from local to global coordinate system. Local displacements in terms of global displacements; global forces in terms of local forces.
  - Element equilibrium equation in the global coordinate system.
- **Read**: Section 6.2.
- **HW#12**: P6.2.2.

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- Review of element equilibrium equations in terms of local and global coordinate systems. Solution of HW#12: P6.2.2.
- **Truss Analysis**:
  - Element equilibrium equation in the local coordinate system.
  - Transformation from local to global coordinate system.
  - Equilibrium equation in the global coordinate system.

- Assembly of the global equilibrium equation.
- Application of boundary conditions.
- Solution of equilibrium equations.
- Element force recovery.

- Example problems: Example 6.2.1, p. 351: calculation of element stiffness matrix; Example 6.2.2, p. 352: calculation of structural stiffness matrix; Example 6.2.3: Planar truss analysis.
- Recovery of reaction forces: two procedures – use of global equilibrium equations, and use of equilibrium equations at the supports.
- **Read**: Section 6.2.
- **HW#13**: P6.2.6.

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- Review of truss analysis using stiffness method: assembly of global equations, application of boundary conditions, solution of the reduced equilibrium equations, element force recovery.
- Solution of HW#13: 6.2.6.
- Use of more efficient way to generate global equilibrium equations. Example 6.2.4, p. 354.
- Recovery of reaction forces: two procedures – use of global equilibrium equations, and use of equilibrium equations at the supports.
- 3D truss element.
- **Read**: Section 6.2.2, Truss Analysis.
- **HW#14**: 6.2.12 (also calculate the support reactions).