Finite Elements For Engineers

Lecture 8: Review of Module 1

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Review of Module 1

- Do you understand the following terms and concepts?
  - Finite element method
  - Finite element model
  - Problem domain and discretization
  - Node
  - Element and element equations
  - Assembly to create system equations
  - Boundary conditions
  - The six major steps

Review

- Do you know the differences between …
  - Full, Banded, Skyline and Sparse Storage schemes
  - Direct Stiffness Method and Galerkin's Method
  - Classical Solution and (element-based) Finite Element Solution

Review

- Do you understand the following terms and concepts?
  - Well-posed problem
  - Degrees of freedom (before and after imposition of BCs)
  - Boundary Conditions (EBC, NBC, Mixed, homogenous, non-homogenous)
  - Primary and secondary unknowns
  - Rank deficiency in element equations

Review

- With respect to Galerkin's method and 1D BVP, do you understand the following terms and concepts?
  - Primary unknown
  - Secondary unknowns
  - Residual function
  - Weighting functions
  - Trial solution and interpolation
  - Requirements for shape functions
  - Integration by parts
  - Checking the quality of the solution
  - *h*-convergence, *p*-convergence, *hp*-convergence

Review

- Do you know how to derive, compute or solve …
  - Element equations for a linear spring
  - Element equations for a 1D heat conduction and convection problem
  - Element equations for a 1D axial deformation of an elastic bar
  - Element equations for a 1D boundary value problem using linear and quadratically interpolated elements
  - Expressions for the flux