ME 712, Finite Element Method Applications   Exam 2, Fall 2012

Formula sheet, closed notes. Test books will be provided.

1. 10 points: Find the stiffness matrix of a 3-noded rod element with cross section area A, density ρ, modulus E, and length L. All calculations must be performed using Guass integration.

2. 10 points: Find the mass matrix for the preceding element.

3. 10 points: The brick element should be validated to make sure that it satisfied $k = \frac{EA}{\ell}$ (stiffness matches the closed form solution). If the load is applied to nodes 5-8, what boundary conditions should be applied to each of the 8 nodes. The drawing below is given only to illustrate order to node numbering. Presume the element is a perfectly rectangular brick. *Write the constraint equations.*
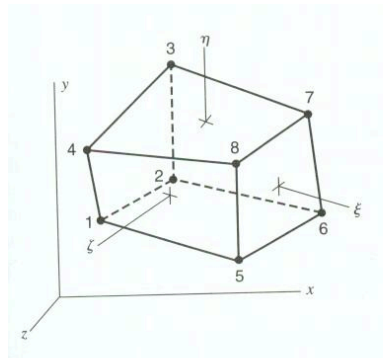
4. 5 points: Define "isoparametric element".

Order	Sampling Location	Weights
1	0	2
2	$\pm\sqrt{3}$	1
3	$\pm\sqrt{0.6}$, 0	5/9, 8/9