MAE 598: Finite Element Methods in Engineering

Project 03

Project Report

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In order to compare solutions with different types of elements to check which elements yield better results for same number of elements, we need to mesh the model using the exactly the same mesh pattern with same no. of elements, however in the first case as 1st order elements (linear) while in the second case as 2nd order elements (quadratic). The following images show the results.

1st Order (Linear) Elements:

In the first case, the model was meshed with 4160 hexahedral 1st order elements having a total of 5192 nodes. The load traction was applied in the form of pressure normal to the surface and varying as t = 200y, with maximum values of 100Mpa and -100Mpa at y=0.5 and y=-0.5 respectively. The boundary conditions fixed support at y = -0.5 on the left edge and roller supports on the YZ plane above the fixed supports so that these nodes are free to move in y direction.

The following image shows the temperature contours obtained.

2nd Order (Quadratic) Elements:

In the 2nd case, the model was meshed with 4160 hexahedral 2nd order elements having a total of 19680 nodes. The loads and boundary conditions similar to the first case are applied in this case as well. (In both cases, the model is meshed with same number of elements in order to check the solution quality and performance for both types of elements).