Static analysis of beam using refined 1D beam models

- A cantilever beam having a square cross-section of edge length equal to **0.2m** and length **2m** made of isotropic material with **E = 75 GPa** and **v = 0.33**. The structure is loaded by a vertical force equal to –50 N at the centre of the free tip (0,L,0) in the negative Z-direction. (Taken form the book - Finite Element Analysis of Structures through Unified Formulation by Professor carrera)

- Lagrange polynomials have been taken for finding the cross sectional displacement field (X,Z)

- Linear,quadratic and cubic elements have been taken for discretization across the beam axis(Y)

- At first the problem has been solved using 1L4 element across the cross section and this produced promising results

- After that the problem has been solved by discretizing the cross section using 2L4 polynomials

- The stiffness matrix is found to be promising(I have checked it manually by deriving some of the components)

- So the problem might arise from the loading vector that I have derived

In this mail I have attached the pdf image showing how I derived the load vector for both 1L4 and 2L4 elements across the cross section. And I have also attached the zip file containing the program that I have done using Python.