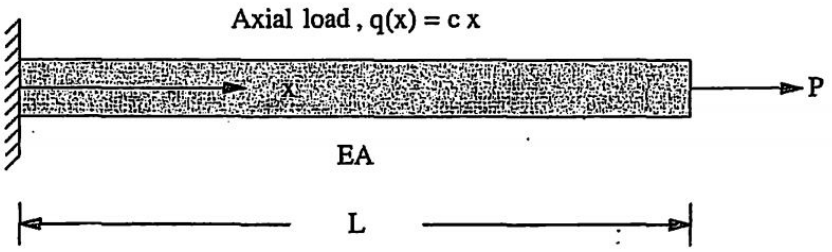
Assignment -2



1. The governing equation for the uniform axially loaded bar is given as
   $EA\left(\frac{d^2u}{dx^2}\right) + cx = 0 \quad 0 < x < L$
   Boundary Conditions $EA\frac{du}{dx} = P$ at $x = L$ and $u = 0$ at $x = 0$
   The potential Energy for the Bar is given as
   $\pi = \int_0^L EA\left(\frac{du}{dx}\right)^2 dx - \int_0^L cxu\, dx - Pu(L) \quad 0 < x < L$

   a. Solve the problem by using the Rayleigh Ritz method assuming a Linear, Quadratic and Cubic trial solution (Hint: The linear solution is of the form $u(x) = a_0 + a_1 x$).
   b. Solve the Problem using the Galerkin method both in Strong and Weak formulation and compare the results with those obtained in part a.
2. Write a computer code that will Solve the following using the Galerkin method (Use the weak form) assuming a Linear, Quadratic and Cubic trial solution
   a. $x^2\left(\frac{d^2U}{dx^2}\right) + 2x\frac{du}{dx} + x = 1 \quad 1 < x < 2$
      Boundary Conditions $\frac{du}{dx} + 2u = 5$ at $x = 2$ and $u(1) = 2$, Compare the results.

3. Write the weak formulation for the following Differential Equation (You do not have to solve it).
   $\left(\frac{d^4U}{dx^4}\right) + 8\frac{d^2U}{dx^2} + 4u = 10 \quad 0 < x < 5$
   Boundary Conditions $u(0) = 0; u'(0) = 1; u(5) = 2; u'(5) = 0$

4. Write a computer code that will solve the PDE in Question 1 of Assignment 1 using the Galerkin weak form approach. Assume a Quadratic, Cubic, Fourth and order solutions and compare the results. Compare the error in both the solution and $\tau = -x\frac{du}{dx}$