EE 202 - Mathematical Techniques in Electrical Engineering

LAB 9

Question 1:

Consider a 1-D differential equation;

$$-\frac{d^2 f(x)}{dx^2} = 3 + 2x^2, \quad f(0) = f(1) = 0$$

Solve this equation using Galerkin's Method of Moments (MoM).

Solution:

```
clear all;clc;
syms x k V Z bn w;
N=2;M=2;n=1:N;
k=3+2*(x^2);

for i=1:N
    for j=1:M
        Z(i,j)=0;V(i)=0;
bn(j)=x-x^(n(j)+1);
B=bn(j);
w(i)=x-x^(n(i)+1);
Z(i,j)=Z(i,j)+int(w(i)*(-1*(diff(diff(B,x),x))), x, 0, 1);
V(i)=V(i)+int(k*(w(i)), x, 0, 1);
    end
end
V(1)
V(2)
Z(1,1)
Z(1,2)
Z(2,1)
Z(2,2)
x=0:0.1:1;
fx=13/10*(x-x.^2)+1/3*(x-x.^3);
fe=5/3*x-3/2*x.^2-1/6*x.^4;
plot(x,fx,'o-b', 'LineWidth', 2)
hold on
plot(x,fe,'r', 'LineWidth', 2)
```

Question 2:

Consider a 1-D differential equation;

$$-\frac{d^2 f(x)}{dx^2} = 1 + x^2, \quad f(0) = f(1) = 0$$

Solve this equation using Galerkin's Method of Moments (MoM).