**ESN 117 - NUMERICAL SOLUTIONS TO CE PROBLEMS**

**COMPLETE MODELING ACTIVITY**

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BSCE III

1. **PROBLEM STATEMENT**

*Deflection of a simply supported beam under a central point load*

A simply supported beam of length 2m is subjected to a point load of 1000N at its center. The beam is made of steel with Young’s modulus of 2.1 x Pa, and its moment of inertia is . Calculate the maximum deflection at the center of the beam and plot the deflection shape along its length.

1. **COMPLETE SOLUTION**

**Given Values:**

P = 1000N, where P is the point load at its center

L = 2m, where L is the length of the supported beam

E = 2.1 x Pa, where E is the beam’s Young’s modulus

I = , where I is its momemnt of inertia

**Formula:**

**Deflection at any point (x):**

For :

For :

**Calculate Maximum Deflection:**

1. **SCILAB CODE**

**// Given values**

**P = 1000; // Load at center (N)**

**L = 2; // Length of beam (m)**

**E = 2.1e11; // Young’s modulus (Pa)**

**I = 8.5e-6; // Moment of inertia (m^4)**

**// Maximum deflection at center**

**delta\_max = (P \* L^3) / (48 \* E \* I);**

**disp("Maximum deflection at center (m): " + string(delta\_max));**

**// Deflection along the beam**

**x = 0:0.01:L;**

**delta = zeros(x);**

**for i = 1:length(x)**

**if x(i) <= L/2 then**

**delta(i) = (P \* x(i) / (48 \* E \* I)) \* (3\*L^2 - 4\*x(i)^2);**

**else**

**delta(i) = (P \* (L-x(i)) / (48 \* E \* I)) \* (3\*L^2 - 4\*(L-x(i))^2);**

**end**

**end**

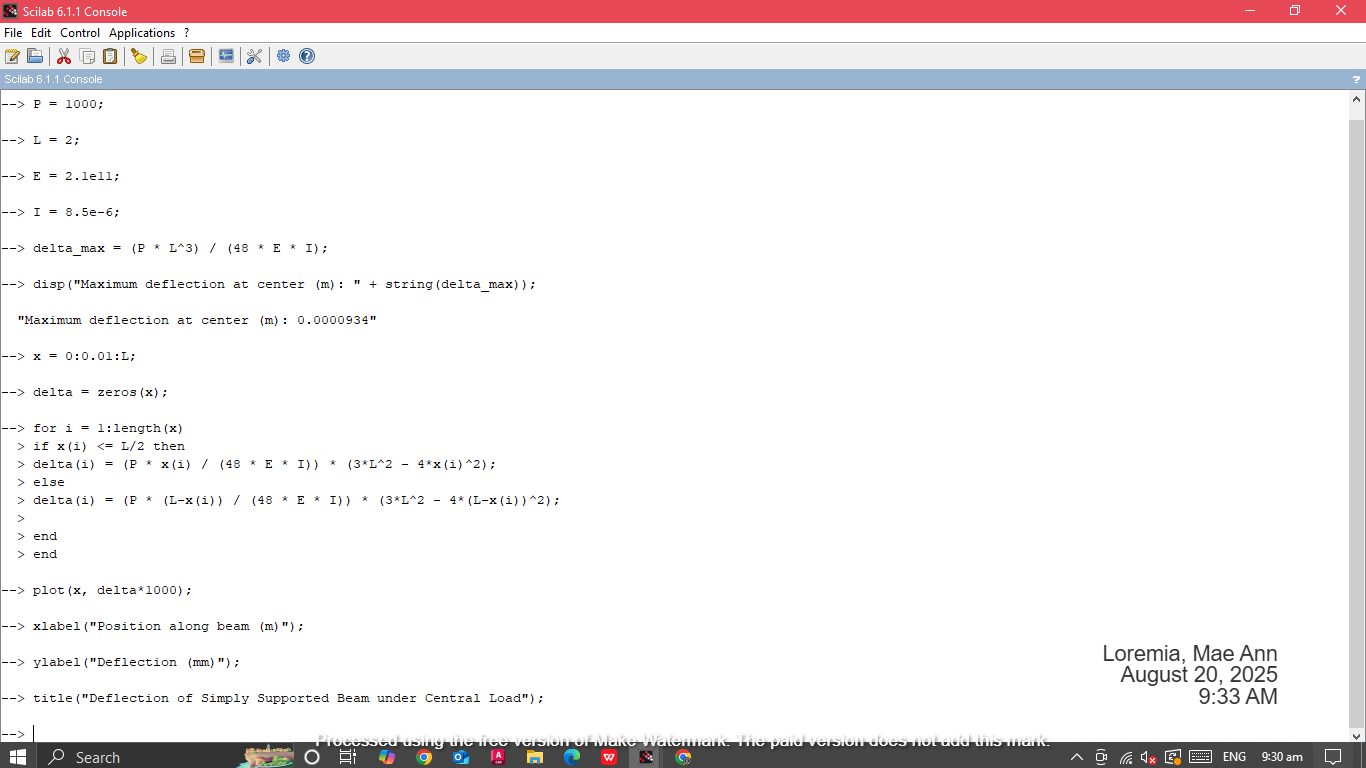
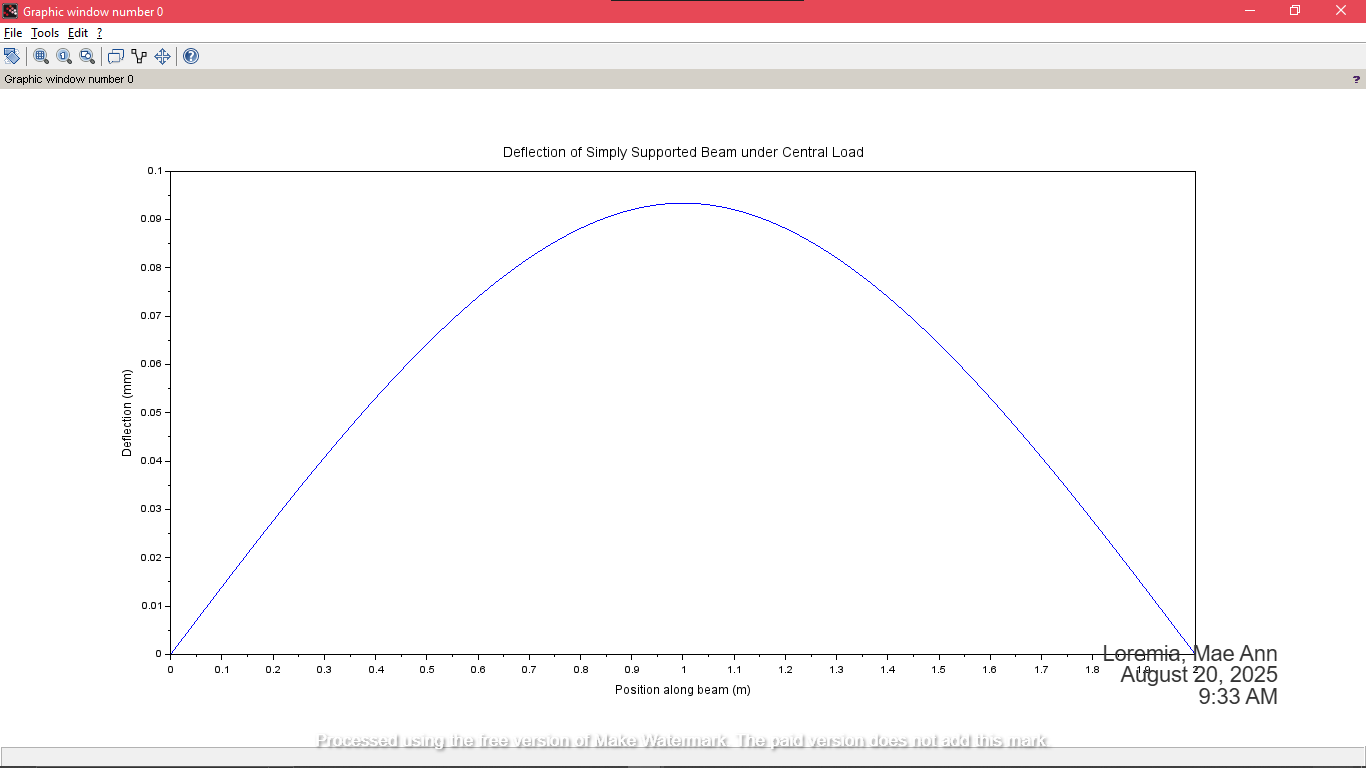
**// Plot deflection shape**

**plot(x, delta\*1000); // Convert to mm for readability**

**xlabel("Position along beam (m)");**

**ylabel("Deflection (mm)");**

**title("Deflection of Simply Supported Beam under Central Load");**

1. **SCREENSHOT OF THE OUTPUT**