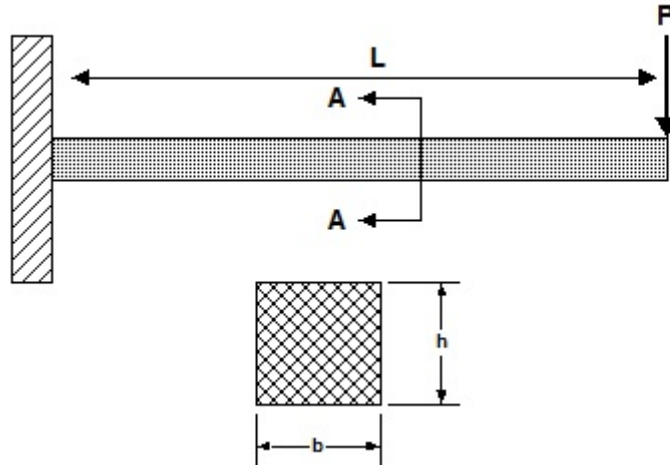


### Computing the deflection of a steel cantilever beam attached to the wall.

Use praktikum.ee.itb.ac.id server for working and writing the program. Remember the procedure you did in Lab #1.

This week you are going to compute the deflection of a steel cantilever beam attached to a wall. Figure 1. shows the configuration of the cantilever beam.



**Figure 1.** Cantilever configuration and Cross Section

The deflection of the end of a cantilever beam as shown in Figure 1. is given by:

$$d = \frac{PL^3}{3EI}$$

where: d = deflection in meters

E = modulus of elasticity, a material constant, =  $2.07 \times 10^{11}$  Pa for structural steel.

I = moment of inertia in  $m^4$

The moment of inertia for a rectangular cross section is computed using:

$$I = \frac{bh^3}{12}$$

Write a program that asks the user for these four items in the following order:

1. The length of the beam (L)
2. The height of the cross section area (h)
3. The base of the cross section area (b)
4. The force that is acting at the end of the beam (P)

Then compute the deflection of the beam using the formulas given above. Remember to compute the deflection we must first compute the moment of inertia. Review the editing and compilation procedure from **Lab#1** if necessary.

Print the following items to the screen as shown:

The length of the beam:  
The height of the cross section area:  
The base of the cross section area:  
The force that is acting at the end of the beam:  
The moment of inertia:  
The deflection:

Next, retrieve an input file for this program from a remote machine using FTP. FTP stands for **File Transfer Protocol** and is a way of moving files between computers that are connected to each other via a network. To start FTP to the remote machine, type

```
ftp praktikum.ee.itb.ac.id
```

This provides a connection from your account to a machine with the address praktikum.ee.itb.ac.id

When the connection is made, you should see something like

```
Connected to praktikum.ee.itb.ac.id.
220----- Welcome to Pure-FTPd [privsep] [TLS] -----
220-You are user number 4 of 50 allowed.
220-Local time is now 04:12. Server port: 21.
220-IPv6 connections are also welcome on this server.
220 You will be disconnected after 15 minutes of inactivity.
User (praktikum.ee.itb.ac.id:(none)):
```

Enter the word **anonymous** at the login prompt. The next prompt will be:

```
230 Anonymous user logged in
ftp>
```

The input file for this lab (and most other files you will FTP this semester) is in the **labs** subdirectory. To access this directory, type **cd labs** and then type **ls** to see which files are in the **labs** subdirectory. To retrieve the input file for this lab, type

```
get lab2.in
```

At this point, the file is copied from the remote machine to your account where it is then available for your use. During the transfer, you will see a series of lines saying

```
200 PORT command successful
150 Opening ASCII mode data connection for lab2.in (22 bytes)
226 Transfer complete
ftp: 22 bytes received in 0.00Seconds 22.00Kbytes/sec.
ftp>
```

When you are done with the FTP session, type **bye** at the FTP prompt and you will then be disconnected from the remote computer. Save these instructions because we will be using FTP frequently this semester.

Use the **more** command to look at the contents of the input file. The three numbers contain the input data in the same order shown in the first part of this lab handout. Run the lab program with the input file that was retrieved via FTP. Remember that to run a code with an external input file, type

```
./lab2 < lab2.in
```

where **lab2** is your executable filename. Demonstrate and submit your program with and without the input file to your lab instructor. You can leave when you are done or you may stay to work on homework.