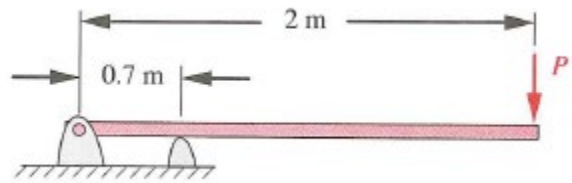
ME 360 – H01 Name _____

USE THIS SHEET AS THE FIRST PAGE OF YOUR HOMEWORK SUBMISSION

1) The diving board shown below has cross-section of 700 x 45 mm with E = 10.3 GPa. Determine maximum bending stress and tip deflection when a 280 lb person is standing at the center of the width at the free end.



σ_{MAX} _____ MPa y_{MAX} _____ mm

2) Write a MATLAB m-file to plot vertical deflection of the diving board in Problem 1) as a function of position along the beam. The plot should be fully annotated with meaningful labels, titles, and legends as appropriate. The MATLAB code provided below shows two ways to implement beam functions. Attach copy of your plot and your MATLAB code.

```
% h01_demo.m - demonstration code for ME 360 H01
% HJSIII, 18.08.17

% constants
L = 10;
a = 4;

% fill column vector from 0 to L with step 0.5
x = ( 0 : 0.5 : L )';

% number of elements in x
n = length( x );

% beam <x-a> function using for-loop and if-statement
for i = 1 : n,
  if x(i) >= a,
    beam1(i) = 1 + 2*x(i) - 2.5*(x(i)-a);
  else
    beam1(i) = 1 + 2*x(i);
  end
end

% beam <x-a> function using conditional-test and dot-multiply
beam2 = 1 + 2*x - 2.5*(x-a).*(x>=a);

% plot both
figure( 1 )
  clf
  plot( x,beam1,'r-', x,beam2,'go' )
  xlabel( 'x [inches]' )
  ylabel( 'beam1 and beam2 [inches]' )
  title( 'Sample plot for beam <x-a> function' )
  legend( 'if-else', 'conditional-test' )

% bottom of h01_demo
```

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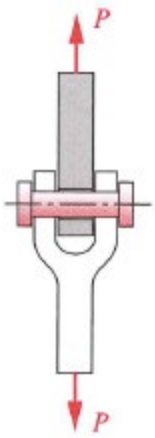
3) Determine suitable pin diameter for the clevis shown to the right when load P = 70 tons assuming allowable shear stress of 23 ksi. Be certain to round up to nearest standard size.



d_{PIN} _____ inch

4) Build a SolidWorks model of a stepped shaft that is 1.25 inch DIA by 1 inch long reduced to 1 inch DIA by 1 inch long with a 1/32 inch fillet radius at the step. Attach the other end of the larger section to a 2.5 inch by 2.5 inch by 0.5 inch thick plate for future FEA studies. Include a large fillet radius between the plate and larger shaft. Provide a hardcopy image of your model.