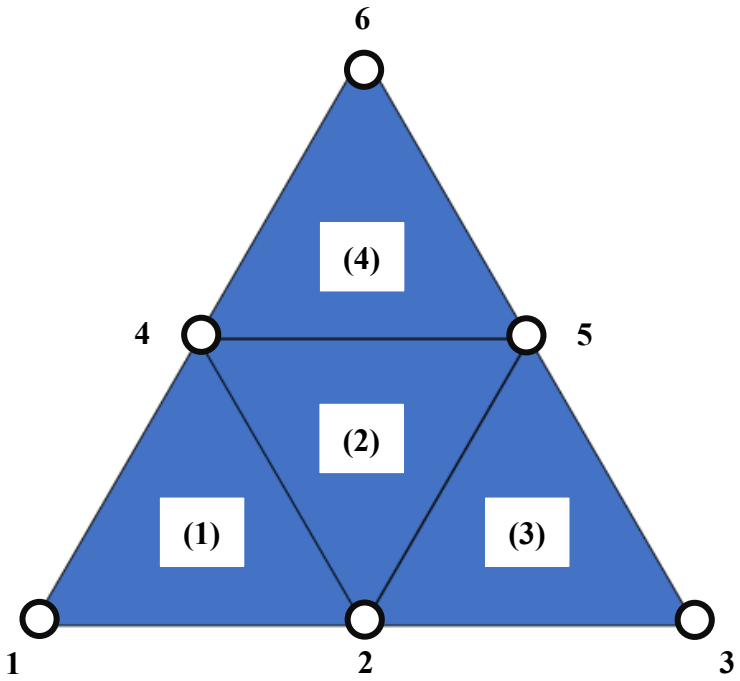
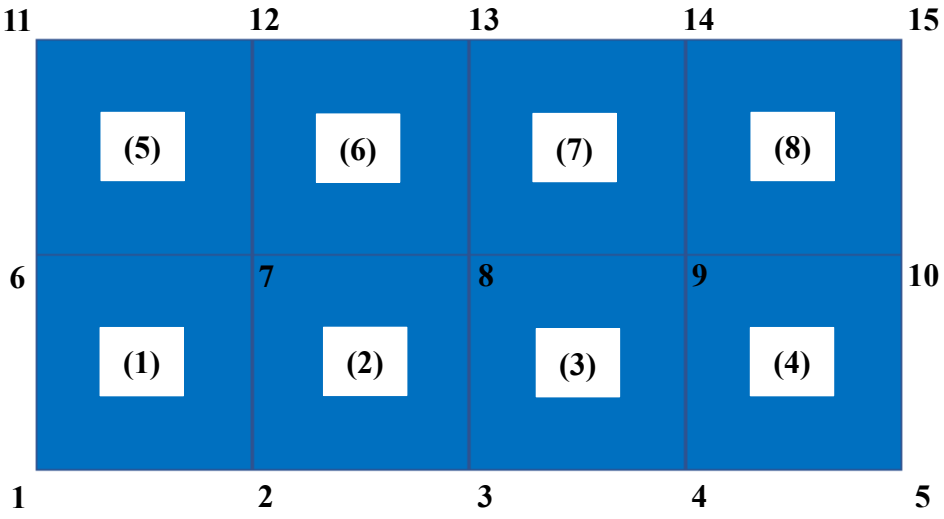
Assignment 2

Due on 12:00 a.m. of Sep. 17

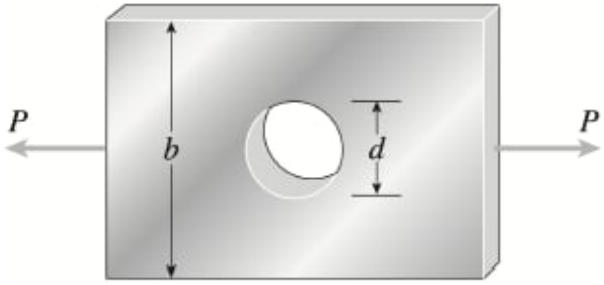
1. As shown in the figure below, please WRITE a **`ReadInput`** function to read the input file of the mesh, and then sketch the figure by the code in the Appendix of this Assignment.

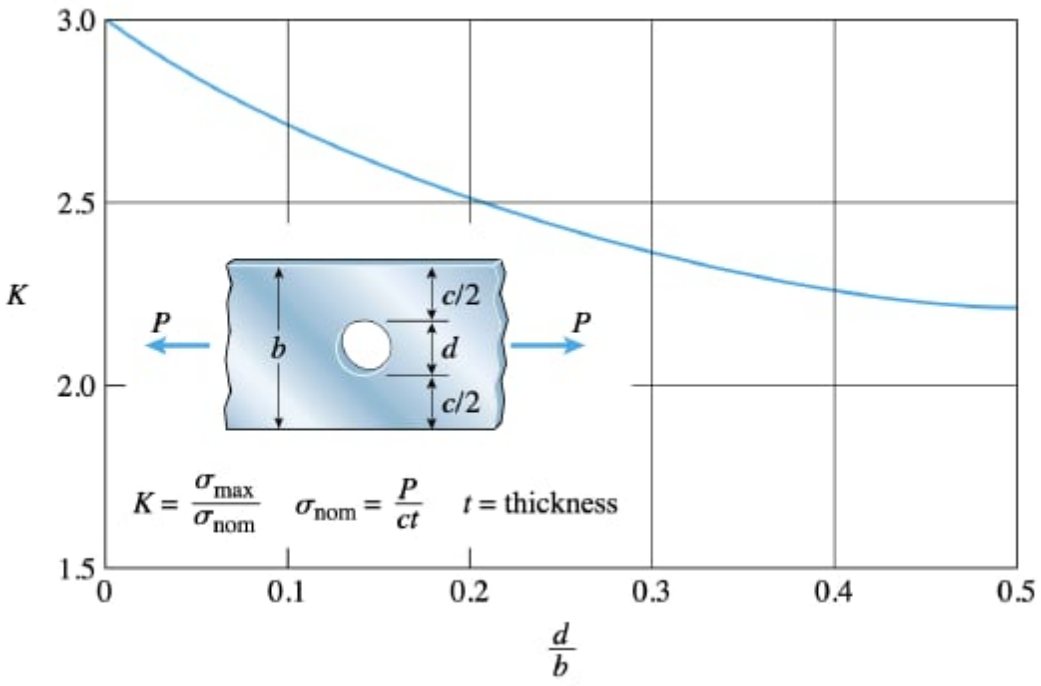


2. As shown in the figure below, please directly USE the **`ReadInput`** function you wrote in Problem 1 to read the input file of the mesh, and then sketch the figure by the code in the Appendix of this Assignment.

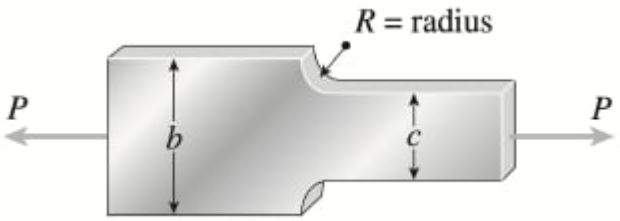


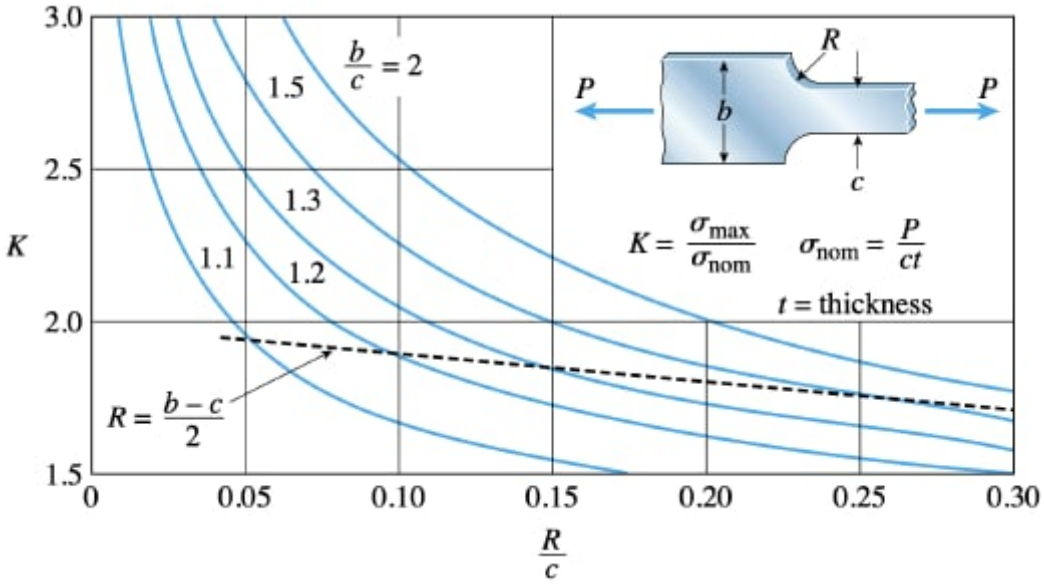
3. A flat bar with a circular hole shown in the figure is subjected to tensile forces P = 1 kN. The bar has thickness t = 5.0 mm.
   (a) Determine the maximum stress for hole diameters d = 18 mm if the width b = 90 mm by hand along with the stress-concentration factor K chart below.
   (b) Solve (a) by your FEM code.
   (c) Please check your finite element results by comparing the calculation in (b) and with the analytical solution in (a)
   (d) Make some comments.





4. A flat bar with shoulder fillets shown in the figure is subjected to tensile forces P = 1 kN. The bar has thickness t = 5.0 mm.
   (a) Determine the maximum stress for fillet radius R = 9 mm if the bar widths b = 90 mm and c = 60 mm by hand along with the stress-concentration factor K chart below.
   (b) Solve (a) by your FEM code.
   (c) Please check your finite element results by comparing the calculation in (b) and with the analytical solution in (a)
   (d) Make some comments.





Appendix

Here is a Matlab function code for plotting a finite element mesh.

```
% Input:
%   coor, 2 by nnd
%   conn, 3 by nel for a mesh of triangular elements or
%         4 by nel for a mesh of quadrilateral elements
% Test:
%   1. Commands:
%   >> coor = [0 1 1 0; 0 0 1 1]; conn= [1 2; 2 3; 4 4];
%   >> plot_mesh(coor,conn);
%   2. Commands:
%   >> coor = [0 1 2 2 1 0; 0 0 0 1 1 1]; conn= [1 2; 2 3; 5 4; 6 5];
%   >> plot_mesh(coor,conn);

function plot_mesh(coor,conn)
  nel = size(conn,2);

  scatter(coor(1,:),coor(2,:),'MarkerFaceColor','r');
  hold on;


  if(size(conn,1) == 3)
    x = zeros(3,2);
    it3 = [1 2 3];

    for iel = 1:nel
      for i = 1:3
        for j = 1:2
          x(i,j) = coor(j,conn(i,iel));
        end
      end
      patch('Vertices',x,'Faces',it3,'FaceColor','none','EdgeColor','b');
    end
  end

  if(size(conn,1) == 4)
    x = zeros(4,2);
    iq4 = [1 2 3 4];

    for iel = 1:nel
      for i = 1:4
        for j = 1:2
          x(i,j) = coor(j,conn(i,iel));
        end
      end
      patch('Vertices',x,'Faces',iq4,'FaceColor','none','EdgeColor','b');
    end
  end

  axis equal;
  box on;
  grid on;
  hold off;

end
```