Fluid Mechanics Program

Engineering 1282.02H

Spring, 2015

Mahnoor Naqvi, Seat 13

S. Heglas Wednesday 3:00

Date of Submission: 2/27/15

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clc;
clear;
fprintf ('\n')
fprintf ('\n***********************************************')
fprintf ('\n* Name: Mahnoor Naqvi Date: 2/26/15 *')
fprintf ('\n* File: Fluid Mechanics Program *')
fprintf ('\n* Instructor: DMG 3:00 *')
fprintf ('\n***********************************************')
fprintf ('\n')
%Explain program to user
fprintf ('This program calculates the key parameters for a rectangular
channel.\nThe input parameters are Volumetric Flow Rate, Width, Height,
Length, Delta P, Viscosity.\n');
fprintf ('The user must input n-1 of these parameters to calculate the nth
parameter, average velocity, shear stress at the wall, Reynolds number, and
Entrance length\n\n');
%loop to run as many times as user wants
YES = 1;
while YES==1
    missing = input('Which parameter is missing? Input\nQ - Volumetric Flow
Rate\nW - Width\nH - Height\nL - Length\nD - Delta P\nV -
Viscosity\n\n','s');
    switch missing
        %find the Viscosity
        case 'V'
        Q = input ('What is the Volumetric Flow Rate?');
        W = input ('What is the Width?');
        H = input ('What is the Height?');
        L = input ('What is the Length?');
        D = input ('What is the change in pressure?');
        missing = (12*Q*L)/(W*(H^3)*D);
        V = missing;
        fprintf ('The Volumetric Flow Rate is %1.2f\n',missing);
        %find the change in pressure
        case 'D'
         Q = input ('What is the Volumetric Flow Rate?');
         W = input ('What is the Width?');
         H = input ('What is the Height?');
         L = input ('What is the Length?');
         V = input ('What is the Viscosity?');
         missing = (Q*12*V*L)/(W*(H^3));
         D = missing;
         fprintf ('The change in pressure is %1.2f\n',missing);
         %find the length
        case 'L'
         Q = input ('What is the Volumetric Flow Rate?');
         W = input ('What is the Width?');
         H = input ('What is the Height?');
         D = input ('What is the change in pressure?');
         V = input ('What is the Viscosity?');
         missing = (W*(H^3)*D)/(Q*12*V);
         L = missing;
         fprintf ('The length is %1.2f\n',missing);
        case 'H'
         Q = input ('What is the Volumetric Flow Rate?');
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        W = input ('What is the Width?');
        D = input ('What is the change in pressure?');
        L = input ('What is the Length?');
        V = input ('What is the Viscosity?');
        missing = ((Q*12*V*L)/(W*D))^(1/3);
        H = missing;
        fprintf ('The height is %1.2f\n',missing);
      case 'W'
        Q = input ('What is the Volumetric Flow Rate?');
        D = input ('What is the change in pressure?');
        H = input ('What is the Height?');
        L = input ('What is the Length?');
        V = input ('What is the Viscosity?');
        missing = (Q*12*V*L)/((H^3)*D);
        W = missing
        fprintf ('The width is %1.2f\n',missing);
      case 'Q'
        D = input ('What is the change in pressure?');
        W = input ('What is the Width?');
        H = input ('What is the Height?');
        L = input ('What is the Length?');
        V = input ('What is the Viscosity?');
        Q = (W*(H^3)*D)/(12*V*L);
        Q = missing;
        fprintf ('The Volumetric Flow Rate is %1.2f\n',missing);
  end
      %find average velocity, shear stress at walls, reynolds number, and
      %elevation Length
    avgv= ((H^2)*D)/(12*V*L);
    Twall = ((H/2)*D)/L;
    DH = (4*W*H)/(2*W+2*H);
    Re = (avgv*DH)/V;
    EL = 0.06*Re*DH;
    fprintf('\nAverage Velocity     - %2.4f cm/s\nShear Stress at Wall -
%1.1f dyne/cm2\nReynolds Number      - %3f\nEntrance Length      - %2.3f
cm\n',avgv,Twall,Re,EL)
    %velocity function and shear stress fuction
    vf=1;
    tf=1;
    i=1;
    %the position is the height
    for k = -H/2:.01:H/2
        j(i)=k;
        vf(i)= (D/(8*V*L))*(H^2-4*(k^2));
        tf(i)= (D*abs(k))/L;
        i=1+i;
    end
    %plot the velocity graph
    plot(j,vf)
    xlabel('Position (cm)');
    ylabel('Velocity cm/s');
    title('Velocity Function (m/s)');
    figure
    %plot the shear stress graph
    plot(j,tf)
    xlabel('Position (cm)');
    ylabel('Shear Stress (dyne/cm2)');
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      title('Shear Stress Function (dyne/cm2)')

    YES = input('\nWould you like to do again? Type 1 for yes, 2 for no.');
end
```

Output →

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* Name: Mahnoor Naqvi Date: 2/26/15 *

* File: Fluid Mechanics Program *

* Instructor: DMG 3:00 *

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This program calculates the key parameters for a rectangular channel.

The input parameters are Volumetric Flow Rate, Width, Height, Length, Delta P, Viscosity.

The user must input n-1 of these parameters to calculate the nth parameter, average velocity, shear stress at the wall, Reynolds number, and Entrance length

Which parameter is missing? Input

Q - Volumetric Flow Rate

W - Width

H - Height

L - Length

D - Delta P

V - Viscosity

Q

What is the change in pressure?1000

What is the Width?3

What is the Height?.2

What is the Length?25

What is the Viscosity?.01

The Volumetric Flow Rate is 81.00

Average Velocity - 13.3333 cm/s

Shear Stress at Wall - 4.0 dyne/cm2

Reynolds Number - 500.000000

Entrance Length - 11.250 cm

Would you like to do again? Type 1 for yes, 2 for no.