```
#include <stdio.h>
#include <math.h>
int main()
{
   printf("Enter internal diameter(in m) of boiler: ");
   float diameter;
   scanf("%f", &diameter);
   printf("Enter internal pressure(in Pa) of boiler: ");
   float pressure;
   scanf("%f", &pressure);
   printf("Enter minimum efficiency of boiler(in percentage): ");
   float efficiency;
   scanf("%f", &efficiency);
   float efficiency_decmial = efficiency/100;
   printf("Enter tension stress(in Nm^-2) of boiler: ");
   float sigma_t;
   scanf("%f", &sigma_t);
   printf("Enter shear stress(in Nm^-2) of boiler: ");
   float tau;
   scanf("%f", &tau);
   printf("Enter crushing stress(in Nm^-2) of boiler: ");
   float sigma_c;
   scanf("%f", &sigma_c);
   printf("Enter number of rivets subjected to single shear: ");
   int n1;
   scanf("%d", &n1);
   printf("Enter number of rivets subjected to double shear: ");
   int n2;
   scanf("%d", &n2);
   int n = n1 + 1.875*n2;
   printf("Enter corrosion allowance ");
```

```
    float ca;
    scanf("%f", &ca);
    float wall_thickness = ((pressure*diameter)/(2*sigma_t*efficiency_decmial)*1000)+ca;
    printf("Wall thickness(in mm) = %f", wall_thickness);
    printf("\n");
    float rivet_diameter;
    if(wall_thickness>8)
    rivet_diameter = 6*pow(wall_thickness, 0.5);
    else if(wall_thickness<8)
    rivet_diameter = (4*sigma_c*wall_thickness)/(3.14*tau);
    printf("Rivet Diameter(in mm) = %f", rivet_diameter);
    printf("\n");
    float rivet_hole_diameter = rivet_diameter + 2;
    printf("Rivet Hole Diameter(in mm) = %f", rivet_hole_diameter);
    printf("\n");
    float pitch =
(n*3.14*rivet_diameter*rivet_diameter*tau)/(4*wall_thickness*sigma_t)+rivet_diameter;
    float pitch_min = 2*rivet_diameter;
    float c;
    printf("Enter number of rivets per pitch length: ");
    printf("\n");
    int rivets_per_pitch;
    scanf("%d", &rivets_per_pitch);
    printf("Enter 1 for LAP JOINT\n");
    printf("Enter 2 for SINGLE STRAP BUTT JOINT\n");
    printf("Enter 3 for DOUBLE STRAP BUTT JOINT\n");
    int choice1;
    scanf("%d", &choice1);
    switch(choice1)
    {
       case 1:
```

```
if(rivets_per_pitch==1)
c=1.31;
else if(rivets_per_pitch==2)
c=2.62;
else if(rivets_per_pitch==3)
c=3.47;
else if(rivets_per_pitch==4)
c=4.17;
else
return 0;
break;
case 2:
if(rivets_per_pitch==1)
c=1.53;
else if(rivets_per_pitch==2)
c=3.06;
else if(rivets_per_pitch==3)
c=4.05;
else
return 0;
break;
case 3:
if(rivets_per_pitch==1)
c=1.75;
else if(rivets_per_pitch==2)
c=3.5;
else if(rivets_per_pitch==3)
c=4.63;
else if(rivets_per_pitch==4)
c=5.52;
else if(rivets_per_pitch==5)
```

```
    c=6.0;
    else
    return 0;
    break;
    default:
    printf("Wrong Choice!!!");
    return 0;
  }
  printf("C = %f", c);
  printf("\n");
  float pitch_max = c*wall_thickness + 41.28;
  float pitch_final;
  if((pitch<=pitch_max) && (pitch>=pitch_min))
  pitch_final = pitch;
  else if(pitch<pitch_min)
  pitch_final = pitch_min;
  else if(pitch>pitch_max)
  pitch_final = pitch_max;
  else
  return 0;
  printf("Pitch of rivets: %f", pitch_final);
  printf("\n");
  float transverse_pitch;
  printf("Enter 1 --> If in a lap or butt joint there are more than one row of rivets and in ehich there is an equal number of rivets in each row of rivets(ZIGZAG RIVETING).\n");
  printf("Enter 2 --> If in a lap or butt joint there are more than one row of rivets and in ehich there is an equal number of rivets in each row of rivets(CHAIN RIVETING).\n");
  printf("Enter 3 --> If number of rivets in outer row is one half of the number of rivets in each row of inner rows and in which the inner rows are zigzag riveted.\n");
  printf("Enter 4 --> If there are full member of rivets.\n");
  int choice2;
  scanf("%d", &choice2);
```

```
   switch(choice2)
   {
      case 1:
      transverse_pitch = 0.33*pitch_final+0.67*rivet_diameter;
      break;
      case 2:
      transverse_pitch = 2*rivet_diameter;
      break;
      case 3:
      transverse_pitch = 0.2*pitch_final+1.15*rivet_diameter;
      break;
      case 4:
      transverse_pitch = 0.165*pitch_final+0.67*rivet_diameter;
      break;
      default:
      printf("Wrong Choice!!!");
      return 0;
   }
   printf("Transverse Pitch: %f", transverse_pitch);
   printf("\n");
   float margin = 1.5*rivet_diameter;
   printf("Margin: %f", margin);
   printf("\n");
   float strap_thickness;
   printf("Enter 1 --> When straps are of unequal width and in which every aternate rivet in outer row is ommited(FOR WIDE STRAP)\n");
   printf("Enter 2 --> When straps are of unequal width and in which every aternate rivet in outer row is ommited(FOR NARROW STRAP)\n");
   printf("Enter 3 --> When straps are of equal width and in which every aternate rivet in outer row is ommited(FOR WIDE STRAP)\n");
   int choice3;
   scanf("%d", &choice3);
```

```
   switch(choice3)
   {
      case 1:
      strap_thickness = 0.75*wall_thickness;
      break;
      case 2:
      strap_thickness = 0.625*wall_thickness;
      break;
      case 3:
      strap_thickness = (0.625*wall_thickness)*((pitch_final-rivet_diameter)/(pitch_final-
2*rivet_diameter));
      break;
      default:
      printf("Wrong Choice!!!");
      return 0;
   }
   printf("Thicness of strap = %f", strap_thickness);
   printf("\n");
   float diameter_ratio = diameter/rivet_diameter;
   float diameter_ratio_square = diameter_ratio*diameter_ratio;
   float number_of_rivets = (diameter_ratio_square*pressure)/tau;
   printf("Number of rivets in circumferential joint: %f", number_of_rivets);
   printf("\n");
   printf("Enter 1 --> When there are a number of circumferential joints in the shell.\n");
   printf("Enter 2 --> When there is an end circumferential joint.\n");
   float circumferential_joint_efficiency;
   float circumferential_joint_efficiency_1;
   float circumferential_joint_efficiency_2;
   int choice4;
   scanf("%d", &choice4);
   switch(choice4)
```

```
    {
      case 1:
      circumferential_joint_efficiency = 0.62;
      break;
      case 2:
      circumferential_joint_efficiency_1 = 0.5*efficiency_decmial;
      circumferential_joint_efficiency_2 = 0.42;
      if(circumferential_joint_efficiency_1<circumferential_joint_efficiency_2)
      circumferential_joint_efficiency = circumferential_joint_efficiency_1;
      else
      circumferential_joint_efficiency = circumferential_joint_efficiency_2;
      break;
      default:
      printf("Wrong Choice!!!");
      return 0;
    }
    float pitch_of_rivets = rivet_diameter/(1-circumferential_joint_efficiency);
    printf("Pitch of rivets = %f", pitch_of_rivets);
    printf("\n");
    float number_of_rivets_in_one_row = (3.14*(diameter+wall_thickness)/pitch_of_rivets);
    float number_of_rows = n/number_of_rivets_in_one_row;
    printf("Number of rows = %f", number_of_rows);
    printf("\n");
    float overlap = transverse_pitch + 2*margin;
    printf("Overlap = %f", overlap);
    printf("\n");
}
```

OUTPUT

Enter internal diameter(in m) of boiler: 1.5

Enter internal pressure(in Pa) of boiler: 1500000

Enter minimum efficiency of boiler(in percentage): 80

Enter tension stress(in Nm^-2) of boiler: 80000000

Enter shear stress(in Nm^-2) of boiler: 60000000

Enter crushing stress(in Nm^-2) of boiler: 120000000

Enter number of rivets subjected to single shear: 0

Enter number of rivets subjected to double shear: 5

Enter corrosion allowance: 2

Wall thickness(in mm) = 19.578125

Rivet Diameter(in mm) = 26.548306

Rivet Hole Diameter(in mm) = 28.548306

Enter number of rivets per pitch length:

5

Enter 1 for LAP JOINT

Enter 2 for SINGLE STRAP BUTT JOINT

Enter 3 for DOUBLE STRAP BUTT JOINT

3

C = 6.000000

Pitch of rivets: 158.748749

Enter 1 --> If in a lap or butt joint there are more than one row of rivets and in ehich there is an equal number of rivets in each row of rivets(ZIGZAG RIVETING).

Enter 2 --> If in a lap or butt joint there are more than one row of rivets and in ehich there is an equal number of rivets in each row of rivets(CHAIN RIVETING).

Enter 3 --> If number of rivets in outer row is one half of the number of rivets in each row of inner rows and in which the inner rows are zigzag riveted.

Enter 4 --> If there are full member of rivets.

3

Transverse Pitch: 62.280300

Margin: 39.822456

Enter 1 --> When straps are of unequal width and in which every aternate rivet in outer row is ommited(FOR WIDE STRAP)

Enter 2 --> When straps are of unequal width and in which every aternate rivet in outer row is ommited(FOR NARROW STRAP)

Enter 3 --> When straps are of equal width and in which every aternate rivet in outer row is ommited(FOR WIDE STRAP)

3

Thicness of strap = 15.311076