```
// the fin design for the cranked heat pipe.
//  the overall heat transfer, total thermal resistance, the total
//  fin efficiency and the fin effectiveness are required to calculate.


#include <iostream.h>
#include <math.h>

double W,L,t1,t,P1,P,Ao,Af,qt,At;
// W is length of fin and also the length of flat panel;L is the height
// of fin, t is the thickness of fin, t1 is the thickness of the flat
panel.
// P1 is the width of flat panel.P is the perimeter of the fin;Ao is the
exposure
// area; Af is the surface area of a single fin;At is the total area; qt
is the
//total heat transfer;
double h,A;  //h is the convection coefficient; A is the
              //cross-sectional area;
double Rw,Aw,Rfins,Rtotal;  //Rw is the thermal resistance of wall; Aw is
the area of wall;
                   //Rfins is the thermal resistance of fins;Rtotal is
total resistance;
double Ti,T8,T0,k,kw;
//Ti is temperature of  internal side of flat panel; T8 is temperature of
ambient;
// T0 is temperature of base wall surface;
//k is the thermal conductivity of fin material aluminum, kw is thermal
conducivity
// of flat panel copper.
double m,Lc,yetafin,yetatotal,deltax;
                    //yetafin is the efficiency of a single fin;
                    //yetatotal is the total efficiency of fins;
                    //deltax is the thickness of the flat panel
double L1;
main ()
{
//cout<<"the number of fins, N="<<endl;
//cin>>N;
//cout<<"the height of fins,L="<<endl;
//cin>>L;
//cout<<"the thickness of fin,t="<<endl;
//cin>>t;
t=0.0005;
//cout<<"estimation of the convection coefficient h="<<endl;
//cin>>h;
h=19.8;
W=0.35;
P1=0.148;
t1=0.0055;
Ti=38;
T8=30;
k=236;
kw=236;
// **int N;  //N is the number of fins;
//**for (N=0;N<55;N++)
int N=47;
for (L;L<0.06;L=L+0.01)
```

```
{
cout<<"h="<<h<<endl;
P=2*(W+t);
A=W*t;
m=sqrt(h*P/(k*A));
Lc=L+t/2;
yetafin=((exp(m*Lc)-exp(-m*Lc))/(exp(m*Lc)+exp(-m*Lc)))/(m*Lc);
cout<<"mLc="<<m*Lc<<"  "<<"L="<<L<<endl;
// cout<<"the single fin efficiency, yetafin="<<yetafin<<endl;


Aw=W*P1;
Ao=W*P1-N*(W*t);
Af=2*(W*Lc);
At=Ao+N*Af;

yetatotal=1-N*Af*(1-yetafin)/At;
// cout<<"total fin efficiency yetatotal="<<yetatotal<<endl;


Rw=t1/(kw*Aw);
Rfins=1/(yetatotal*h*At);
T0=(Ti/Rw+T8/Rfins)/(1/Rw+1/Rfins);
Rtotal=Rw+Rfins;

cout<<"yetafin="<<yetafin<<"yetatotal="<<yetatotal<<"Rtotal="<<Rtotal<<en
dl;


qt=h*At*(1-N*Af*(1-yetafin)/At)*(T0-T8);
cout<<"total heat transfer qt="<<qt<<endl;
cout<<"*********************************************"<<endl;
}


return 0;
}
```