#include<stdio.h>

#include<conio.h>

#include<math.h>

main()

{

int k,nfan,nm,me=2;

int gwf,mwf,phff,xpsf,puff,epsf;

int n,eps,puf,xps,phf,mw,gw,epsp,pufp,xpsp,phfp,mwp,gwp,epsc,pufc,xpsc,phfc,mwc,gwc;

float x,ph,v,h,a,ca,cl,cw,ar,pr,prw,tlcs,twcs,la,arw,PUF,XPS,EPS,PHF,MIW,GLW;

float I,Q1,U,BR,CM,HI,HO,CHI,CHO,To,Ti,Q2,UP,da,Ud,IP,EPSP,PUFP,XPSP,PHFP,MIWP,GLWP,Q3,UC,RCC,IC,EPSC,PUFC,XPSC,PHFC,MIWC,GLWC;

float Q,Q4,UF,CON,IF,EPSF,PUFF,XPSF,PHFF,MIWF,GLWF;

float m,Cpm,T1,T2,tch,Qc,hfg,ft,Qf,hg,Qr,Tg,Tf,Cpmm,tco,Qff,Qfan=20,QFAN,Qwh=300,QWH;

float QIf,Qv,den,vel,Hter,Hinit;

printf("\t\t\t=============================");

printf("\n\t\t\t\tCRAYO-SOFT\n\t\t------------------------------------------\n\n");

printf("\t\*\*\*\*\*\*\* A SOFTWARE FOR DESIGNING COLD STORAGE \*\*\*\*\*\*\*\n\n\tDesigned by: Aniket and Tuhin. Developed by: Dipankar \n\t \t F/ Agricultural Engineering,BCKV\_2013");

printf("\n================================================================================");

printf("\n\tChoose your design- DEFAULT DESIGN (1) or NEW DESIGN (2) :");

scanf("%d",&k);

printf("\n\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_");

if(k==1)

{printf("\nDimension of Cold Storage:\n\tCapacity of cold storage=5000Mt.\n\tSpecific Product Density=3.4 Kg/m3.");

printf("\n\tHeight of cold storage=13.7 m.\n\tNo. of Chamber= 4\n\tEach Chamber length=18.5 m.");

printf("\n\tEach Chamber Width=1.45 m.\n\tAnte Room width=4.44 m\n\tPreCooling chamber Width=12 m.\n\tTotal length of Cold Storage=14.9 m");

printf("\n\tTotal Width of Cold Storage=41.44 m2\n\tLayout Area=617.456 m2\n");

printf("............................................");

printf("\nHeat load Data:");

printf("\n\tTHE HEAT LOAD OF COLD STORAGE=100 W\n");

printf("\tCHILLING LOAD =.5 Kcal/m.");

printf("\n\tFREEZING LOAD=.5 Kcal/m.");

printf("\n\tRESPIRATION LOAD= .5 Kcal/m.");

printf("\n\tTHE COOLING LOAD BELOW FREEZING TEMP.=.5 Kcal/m.");

printf("\n\n\tFAN LOAD=.5 W");

printf("\n\tWORKING LOAD FOR HUMAN=.5 W");

printf("\n\tCOOLING LOAD FOR ELECTRICAL APPLIANCES= 33.5 W/m2");

printf("\n\n\tVENTILATION LOAD =.5 UNIT");

printf("\n\tINFILTRATION LOAD= .5 UNIT");

printf("\n\n\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*END\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*");

}

else

{

printf("\n\n\tEnter the value of capacity of cold storage(M ton):\n" );

scanf("%f",&x);

printf("\t Specific Product density(kg/m3) :\n");

scanf("%f",&ph);

printf(" \tHeight of cold storage(m):\n");

scanf("%f",&h);

if(x==5000)

{if(ph==3.4)

v=5000/3.4;

else

v=5000/ph;

}

else

{if(ph==3.4)

v=x/3.4;

else

v=x/ph;

};

if(h==13.7)

{ a=v/13.7;

}

else

{a=v/h;

};

printf("enter the no of chamber ( take only even no of chamber ):");

scanf("%d",&n);

if(n==4)

ca=a/4;

else

ca=a/n;

printf("enter the lenght of each chamber(m):\n");

scanf("%f",&cl);

if(cl==18.5)

cw=ca/18.5;

else

cw=ca/cl;

printf("\t\t\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\n\t\tDimention of Cold Storage:\n\t\t+++++++++++++++++++++++++++");

printf("\n\tEach chamber width=%f m\n\tEach Chamber Length=%f m",cw,cl);

printf(" \n\tEach chamber area=%f m2",ca);

printf("\n\tTotal chamber area=%f m2\n",a);

ar=.12\*a;

if(n==4)

{arw=ar/(.5\*4\*cw);}

else

arw=ar/(.5\*n\*cw);

pr=.35\*a;

prw=12;

if(n==4)

tlcs=(2\*cw)+prw;

else

tlcs=(0.5\*n\*cw)+prw;

twcs=(2\*cl)+arw;

la=tlcs\*twcs;

printf("\tTotal length of Cold Storage=%f m.\n\tTotal width of Cold Storage=%f m.",tlcs,twcs);

printf("\n\tThe Layout Area=%f m2.",la);

printf("\n\t-------------------------------------\n\n\n");

printf("\*\*\*\*CALCULATION OF HEAT LOAD OF COLD STORAGE\*\*\*\*\n=====================================================================");

printf("\n\t\*\*\* Calculation of Q and U value for External wall \*\*\*\t");

printf("\n------------------------------------------------------------\n");

printf("\n\tenter 1(if you want to use EPS) or 0 (if not):\_\_");

scanf("%d",&eps);

printf("\n\tenter 1(if you want to use PUF) or 0 (if not):\_\_");

scanf("%d",&puf);

printf("\n\tenter 1(if you want to use XPS) or 0 (if not):\_\_");

scanf("%d",&xps);

printf("\n\tenter 1(if you want to use Phenolic Foam) or 0 (if not):\_\_");

scanf("%d",&phf);

printf("\n\tenter 1(if you want to use Mineral Wool) or 0 (if not):\_\_");

scanf("%d",&mw);

printf("\n\tenter 1(if you want to use Glass Wool) or 0 (if not):\_\_");

scanf("%d",&gw);

EPS=eps\*(.150/.036);

PUF=puf\*(.100/.023);

XPS=xps\*(.100/.025);

PHF=phf\*(.100/.026);

MIW=mw\*(.125/.033);

GLW=gw\*(.125/0.033);

I=EPS+PUF+XPS+PHF+MIW+GLW;

BR=(.100/.04);

CM=(.020/.04);

printf("\n\tenter the value of external and internal temperature('C):");

scanf("%f%f",&To,&Ti);

printf("\n\tenter the value of Hi and Ho:");

scanf("%f%f",&HI,&HO);

CHI=(1/HI);

CHO=(1/HO);

U=1/(CHI+CHO+BR+CM+I);

printf("\n\t\tTHE 'U' VALUE FOR EXTERNAL WALL=%f W/m^2",U);

if(h==13.7)

Q1=U\*((2\*13.7\*tlcs)+(2\*twcs\*13.7))\*(To-Ti);

else

Q1=U\*((2\*h\*tlcs)+(2\*h\*twcs));

printf("\n\t\tTHE HEAT-LOAD OF EXTERNAL WALL=%f W",Q1);

printf("\n\t\t\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\n");

printf("\nCalculation of Q and U value for Partition wall");

printf("\n------------------------------------------------------------\n");

printf("\n\tenter 1(if you want to use EPS) or 0 (if not):\_\_");

scanf("%d",&epsp);

printf("\n\tenter 1(if you want to use PUF) or 0 (if not):\_\_");

scanf("%d",&pufp);

printf("\n\tenter 1(if you want to use XPS) or 0 (if not):\_\_");

scanf("%d",&xpsp);

printf("\n\tenter 1(if you want to use Phenolic Foam) or 0 (if not):\_\_");

scanf("%d",&phfp);

printf("\n\tenter 1(if you want to use Mineral Wool) or 0 (if not):\_\_");

scanf("%d",&mwp);

printf("\n\tenter 1(if you want to use Glass Wool) or 0 (if not):\_\_");

scanf("%d",&gwp);

EPSP=epsp\*(.075/.036);

PUFP=pufp\*(.050/.023);

XPSP=xpsp\*(.050/.025);

PHFP=phfp\*(.050/.026);

MIWP=mwp\*(.050/.033);

GLWP=gwp\*(.050/0.033);

IP=EPSP+PUFP+XPSP+PHFP+MIWP+GLWP;

UP=1/(CHI+CHO+BR+CM+IP);

printf("\n\t\tTHE 'U' VALUE FOR PARTION WALL=%f W/m2",UP);

da=2\*3;

Ud=.03;

if(h==13.7)

{

if(n==4)

Q2=((UP\*((twcs\*13.7\*4)-(4\*da)))+(4\*Ud\*da))\*(To-Ti);

else

Q2=((UP\*((twcs\*13.7\*n)-(n\*da)))+(n\*da\*Ud))\*(To-Ti);

}

else{

if(n==4)

Q2=((UP\*((twcs\*h\*4)-(4\*da)))+(4\*da\*Ud))\*(To-Ti);

else

Q2=((UP\*((twcs\*h\*n)-(n\*da)))+(n\*da\*Ud))\*(To-Ti);

}

printf("\n\t\tTHE HEAT-LOAD OF PARTITION WALL=%f W\n",Q2);

printf("\t\t\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\n");

printf("\nCalculation for Q and U value of Ceiling");

printf("\n------------------------------------------------------------\n");

printf("\n\tenter 1(if you want to use EPS) or 0 (if not):\_\_");

scanf("%d",&epsc);

printf("\n\tenter 1(if you want to use PUF) or 0 (if not):\_\_");

scanf("%d",&pufc);

printf("\n\tenter 1(if you want to use XPS) or 0 (if not):\_\_");

scanf("%d",&xpsc);

printf("\n\tenter 1(if you want to use Phenolic Foam) or 0 (if not):\_\_");

scanf("%d",&phfc);

printf("\n\tenter 1(if you want to use Mineral Wool) or 0 (if not):\_\_");

scanf("%d",&mwc);

printf("\n\tenter 1(if you want to use Glass Wool) or 0 (if not):\_\_");

scanf("%d",&gwc);

EPSC=epsc\*(.150/.036);

PUFC=pufc\*(.100/.023);

XPSC=xpsc\*(.100/.025);

PHFC=phfc\*(.125/.026);

MIWC=mwc\*(.125/.033);

GLWC=gwc\*(.125/0.033);

IC=(EPSC+PUFC+XPSC+PHFC+MIWC+GLWC);

RCC=.100/.5;

UC=1/(CHI+CHO+RCC+IC);

printf("\n\n\t\tTHE 'U' VALUE FOR CEILING=%f W/m2\n",UC);

Q3=UC\*a\*(To-Ti);

printf("\n\t\tTHE HEAT-LOAD OF CEILING=%f W\n",Q3);

printf("\t\t\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\n");

printf("\nCalculation of Q and U value of Floor");

printf("\n------------------------------------------------------------\n");

printf("\n\tenter 1(if you want to use EPS) or 0 (if not):\_\_");

scanf("%d",&epsf);

printf("\n\tenter 1(if you want to use PUF) or 0 (if not):\_\_");

scanf("%d",&puff);

printf("\n\tenter 1(if you want to use XPS) or 0 (if not):\_\_");

scanf("%d",&xpsf);

printf("\n\tenter 1(if you want to use Phenolic Foam) or 0 (if not):\_\_");

scanf("%d",&phff);

printf("\n\tenter 1(if you want to use Mineral Wool) or 0 (if not):\_\_");

scanf("%d",&mwf);

printf("\n\tenter 1(if you want to use Glass Wool) or 0 (if not):\_\_");

scanf("%d",&gwf);

EPSF=epsf\*(.125/.036);

PUFF=puff\*(.100/.023);

XPSF=xpsf\*(.100/.025);

PHFF=phff\*(.100/.026);

MIWF=mwf\*(.100/.033);

GLWF=gwf\*(.100/0.033);

IF=EPSF+PUFF+XPSF+PHFF+MIWF+GLWF;

CON=.100/.6;

UF=1/(CHI+CON+IF);

printf("\n\t\tTHE 'U' VALUE FOR FLOOR=%f W/m2",UF);

Q4=UF\*a\*(To-Ti);

printf("\n\t\tTHE HEAT-LOAD OF FLOOR=%f W\n",Q4);

Q=Q1+Q2+Q3+Q4;

printf("\n\n\tTHE TOTAL HEAT-LOAD OF COLD STORAGE=%f W\n\t....................................................",Q);

printf("\n----------------------------------------------------------------------------------\n");

printf("\n\n\*\*\*\*\*\*CALCULATION OF PRODUCT LOAD\*\*\*\*\*\*\n===================================================");

printf("\n Enter mass of product, Mean specific heat of product, Initial temp, final temperature, chilling time(hr) :");

scanf("%f%f%f%f%f",&m,&Cpm,&T1,&T2,&tch);

Qc=(m\*Cpm\*(T1-T2))/tch;

printf("\n Enter latent heat of freezing, freezing time(hr): ");

scanf("%f%f",&hfg,&ft);

Qf=(m\*hfg)/ft;

printf("\n Enter the heat generated per kg of food/hr :");

scanf("%f",&hg);

Qr=m\*hg;

printf("\n Enter actual storage temperature of product, freezing temp of product, sp. heat of freezing product, cooling time(hr) :");

scanf("%f%f%f%f",&Tg,&Tf,&Cpmm,&tco);

Qff=(m\*Cpmm\*(Tg-Tf))/tco;

printf("\n\n\tCHILLING LOAD =%f Kcal/m.",Qc);

printf("\n\tFREEZING LOAD=%f Kcal/m.",Qf);

printf("\n\tRESPIRATION LOAD=%f Kcal/m.",Qr);

printf("\n\tTHE COOLING LOAD BELOW FREEZING TEMP.=%f Kcal/m.",Qff);

printf("\n\n\n\*\*\*\*\*\*\*\*\*CALCULATION OF HEAT LOAD FROM EQUIPMENT\*\*\*\*\*\*\*\*\*\n==========================================================");

printf("\n\nEnter the total no of fans");

scanf("%d",&nfan);

QFAN=nfan\*Qfan\*1000;

printf("\nEnter no of person working");

scanf("%d",&nm);

QWH=nm\*Qwh\*1000;

printf("\n\n\tFAN LOAD=%f W",QFAN);

printf("\n\tWORKING LOAD FOR HUMAN=%f W",QWH);

printf("\n\tCOOLING LOAD FOR ELECTRICAL APPLIANCES= 33.5 W/m2");

printf("\n\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_");

printf("\n\n\*\*\*\*\*\*\*\*\*CALCULATION OF VENTILATION LOAD AND INFILTRATION LOAD\*\*\*\*\*\*\*\*\*\n=========================================================");

printf("\nEnter Outside air Density, Air Velocity, Enthalpy of Initial and TerminalEnthalpy:");

scanf("%f%f%f%f",&den,&vel,&Hinit,&Hter);

Qv=me\*den\*vel\*(Hter-Hinit);

printf("\n\n\tVENTILATION LOAD =%f UNIT",Qv);

QIf=.20\*Qv;

printf("\n\tINFILTRATION LOAD=%f UNIT",QIf);

printf("\n\n....................................................................\n\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*END\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\* }

getch();

return 0;

}