#Q4

A = 0.29;

B = 47.052E-3;

C = -15.716E-6;

D = 0;

T0= 600; %K

R = 8.314;

P1 = 1; %Bar

P2 = 33.3706; %Bar = 484 psia

% iteration for Ta

Tg=1.01\*T0;

CpsR=A+(B+(C+D/(Tg^2\*T0^2))\*((Tg+T0)/2))\*(Tg-T0)/(log(Tg/T0));

a=log(P2/P1);

T1=T0\*exp(a/CpsR);

CpsR1=A+(B+(C+D/(T1^2\*T0^2))\*((T1+T0)/2))\*(T1-T0)/(log(T1/T0));

T2=T0\*exp(a/CpsR1);

CpsR2=A+(B+(C+D/(T2^2\*T0^2))\*((T2+T0)/2))\*(T2-T0)/(log(T2/T0));

T3=T0\*exp(a/CpsR2);

Ta=T3;

dHigR=A\*(Ta-T0)+B/2\*(Ta^2-T0^2)+(C/3)\*(Ta^3 - T0^3);

dHig=dHigR\*8.314;

dHigreal=dHig/0.75;

% find work

work=dHigreal\*33.9602046;

work\_in\_kw = work / 1000; %KW

%%

% find real T, iterate again

Ta = 600;

Tg1=Ta;

CpHR=A+B/2\*(Tg1+Ta)+C/3\*(Tg1^2+Tg1\*Ta+Ta^2);

dHigrealR=dHigreal/R;

Tf1=dHigrealR/CpHR+Ta;

CpHR1=A+B/2\*(Tf1+Ta)+C/3\*(Tf1^2+Tf1\*Ta+Ta^2);

Tf2=dHigrealR/CpHR1+Ta;

CpHR2=A+B/2\*(Tf2+Ta)+C/3\*(Tf2^2+Tf2\*Ta+Ta^2);

Tf3=dHigrealR/CpHR2+Ta;

CpHR2=A+B/2\*(Tf3+Ta)+C/3\*(Tf3^2+Tf3\*Ta+Ta^2);

Tf4=dHigrealR/CpHR2+Ta;

%%Tf 723.3461 K

%%Work: 854.0413kW

#Q6

P=3337.06;

R=8.314;

A\_to=13.932; B\_to=3056.96; C\_to=217.625;

A\_bi=14.6372; B\_bi=4576.67; C\_bi=201.594;

Tsat\_to=B\_to/(A\_to-log(P))-C\_to;

Tsat\_bi=B\_bi/(A\_bi-log(P))-C\_bi;

T\_to=Tsat\_to+100+273.15;

T\_bi=Tsat\_bi+100+273.15;

T\_h=901.3358;

T\_to\_f=698.1111;

T\_LR=310.928;

T\_guess=T\_LR;

H\_LR=0;

Ato=0.290;Bto=47.052E-3;Cto=-15.716E-6;Dto=0;

Abi=13.83;Bbi=51.7E-3;Cbi=-16.33E-6;Dbi=-7.578E5;

Ah=3.249;Bh=0.422E-3;Ch=0;cpmixR4 = 11.69576;Dh=0.083E5;

Ame=1.702;Bme=9.081E-3;Cme=-2.164E-6;Dme=0;

dHR\_to=Ato\*(T\_guess-T\_to)+Bto/2\*(T\_guess^2-T\_to^2)+Cto/3\*(T\_guess^3-T\_to^3)+Dto\*((T\_guess-T\_to)/(T\_guess\*T\_to));

dHR\_bi=Abi\*(T\_guess-T\_bi)+Bbi/2\*(T\_guess^2-T\_bi^2)+Cbi/3\*(T\_guess^3-T\_bi^3)+Dbi\*((T\_guess-T\_bi)/(T\_guess\*T\_bi));

dHR\_h=Ah\*(T\_guess-T\_h)+Bh/2\*(T\_guess^2-T\_h^2)+Ch/3\*(T\_guess^3-T\_h^3)+Dh\*((T\_guess-T\_h)/(T\_guess\*T\_h));

dHR\_to\_f=Ato\*(T\_guess-T\_to\_f)+Bto/2\*(T\_guess^2-T\_to\_f^2)+Cto/3\*(T\_guess^3-T\_to\_f^3)+Dto\*((T\_guess-T\_to\_f)/(T\_guess\*T\_to\_f));

dH\_to=dHR\_to\*R\*11.32006819;

dH\_bi=dHR\_bi\*R\*134.99181316497;

dH\_h=dHR\_bi\*R\*44.431267657;

dH\_to\_f=dHR\_to\_f\*R\*33.96020457;

dHcool=dH\_to+dH\_bi+dH\_h+dH\_to\_f;

y\_to=0.047534165;

y\_bi=0.14171123;

y\_h=0.237670826;

y\_me=0.573083779;

Amix=y\_to\*Ato+y\_bi\*Abi+y\_h\*Ah+y\_me\*Ame;

Bmix=y\_to\*Bto+y\_bi\*Bbi+y\_h\*Bh+y\_me\*Bme;

Cmix=y\_to\*Cto+y\_bi\*Cbi+y\_h\*Ch+y\_me\*Cme;

Dmix=y\_to\*Dto+y\_bi\*Dbi+y\_h\*Dh+y\_me\*Dme;

Tk1=T\_LR;

CpmixR=Amix+Bmix/2\*(Tk1+T\_guess)+Cmix/3\*(Tk1^2+Tk1\*T\_guess+T\_guess^2)+Dmix/(Tk1\*T\_guess);

dH\_RF=-dHcool/952.5837382;

dH\_RFR=dH\_RF/R;

Tk2=dH\_RFR/CpmixR+T\_guess;

CpmixR1=Amix+Bmix/2\*(Tk2+T\_guess)+Cmix/3\*(Tk2^2+Tk2\*T\_guess+T\_guess^2)+Dmix/(Tk2\*T\_guess);

Tk3=dH\_RFR/CpmixR1+T\_guess;

CpmixR2=Amix+Bmix/2\*(Tk3+T\_guess)+Cmix/3\*(Tk3^2+Tk3\*T\_guess+T\_guess^2)+Dmix/(Tk3\*T\_guess);

Tk4=dH\_RFR/CpmixR2+T\_guess;

CpmixR3=Amix+Bmix/2\*(Tk4+T\_guess)+Cmix/3\*(Tk4^2+Tk4\*T\_guess+T\_guess^2)+Dmix/(Tk4\*T\_guess);

Tk5=dH\_RFR/CpmixR3+T\_guess;

CpmixR4=Amix+Bmix/2\*(Tk5+T\_guess)+Cmix/3\*(Tk5^2+Tk5\*T\_guess+T\_guess^2)+Dmix/(Tk5\*T\_guess);

Tk6=dH\_RFR/cpmixR4+T\_guess;

disp(Tk6)

%%Tk6=662.9704K

#Q7

Amix=3.7212;

Bmix=0.0149;

Cmix=-4.3013E-6;

Dmix=-1.0542E+5;

T0= 662.97; %K

R = 8.314;

P1=33.3706;

P2=39.3001;

% iteration for Ta

Tg=1.01\*T0;

CpsR=Amix+(Bmix+(Cmix+Dmix/(Tg^2\*T0^2))\*((Tg+T0)/2))\*(Tg-T0)/(log(Tg/T0));

a=log(P2/P1);

T1=T0\*exp(a/CpsR);

CpsR1=Amix+(Bmix+(Cmix+Dmix/(T1^2\*T0^2))\*((T1+T0)/2))\*(T1-T0)/(log(T1/T0));

T2=T0\*exp(a/CpsR1);

CpsR2=Amix+(Bmix+(Cmix+Dmix/(T2^2\*T0^2))\*((T2+T0)/2))\*(T2-T0)/(log(T2/T0));

T3=T0\*exp(a/CpsR2);

Ta=T3;

dHigR=Amix\*(Ta-T0)+Bmix/2\*(Ta^2-T0^2)+Cmix/3\*(Ta^3-T0^3)+Dmix\*((Ta-T0)/(Ta\*T0));

dHig=dHigR\*8.314;

dHreal=dHig/0.85;

% find work

work=dHreal\*952.5837382;

work\_in\_kw = work/1000; %KW

%work\_in\_kw= 1123.8 KW

%%

% find real T, iterate again

Tg1=Ta;

dHrealR = dHreal/8.314;

CpHR=Amix+Bmix/2\*(Tg1+T0)+Cmix/3\*(Tg1^2+Tg1\*T0+T0^2)+Dmix/(Tg1\*T0);

Tf1=dHrealR/CpHR+T0;

CpHR1=Amix+Bmix/2\*(Tf1+T0)+Cmix/3\*(Tf1^2+Tf1\*T0+T0^2)+Dmix/(Tf1\*T0);

Tf2=dHrealR/CpHR1+T0;

%%Tf=674.1184K

#Q8

A=3.7212;

B=0.0149;

C=-4.3013E-6;

D=-1.0542E5;

R=8.314;

P1=39.3001;

P2=39.3001;

T1=674.1184;

T2=922.0389;

Xto=0.047534165181224;

Xh=0.23767082590612;

Xme=0.573083778966132;

Xbi=0.141711229946524;

%% Residual 1

Tch1=43.6/(1+(21.8/(2.016\*T1)));

Pch1=20.5/(1+(44.2/(2.016\*T1)));

Tc1=772.16\*Xbi+Tch1\*Xh+591.8\*Xto+190.6\*Xme;

Pc1=34.74\*Xbi+Pch1\*Xh+41.06\*Xto+45.99\*Xme;

omega=0.012\*Xme+0.262\*Xto+0.423\*Xbi;

Tr1=T1/Tc1;

Pr1=P1/Pc1;

HR01= -0.157316112;

HR11= 0.135460648;

HR1=HR01+omega\*HR11;

H1R=HR1\*R\*Tc1;

%% Residual 2

Tch2=43.6/(1+(21.8/(2.016\*T2)));

Pch2=20.5/(1+(44.2/(2.016\*T2)));

Tc2=772.16\*Xbi+Tch2\*Xh+591.8\*Xto+190.6\*Xme;

Pc2=34.74\*Xbi+Pch2\*Xh+41.06\*Xto+45.99\*Xme;

Tr2=T2/Tc2;

Pr2=P2/Pc2;

HR02= -0.0660306075;

HR12= 0.1580802185;

HR2=HR02+omega\*HR12;

H2R=HR2\*R\*Tc2;

%% Hig

dHigR=A\*(T2-T1)+B/2\*(T2.^2-T1.^2)+C/3\*(T2.^3-T1.^3)+D\*(T2-T1)/(T2\*T1);

dHig=dHigR\*8.314;

Htotal=-H1R+dHig+H2R;

Htotal=Htotal\*952.583738182994/1000;

disp(Htotal)

%%Heat=2.5089e+04kW