DEVELOPMENT OF EQUILIBRIUM MODEL OF VACUUM DISTILLATION FOR BENZENE/TOLUENE SEPARATION USING MOSAIC SOFTWARE

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DEVELOPMENT OF EQUILIBRIUM MODEL OF VACUUM DISTILLATION FOR BENZENE/TOLUENE SEPARATION USING MOSAIC SOFTWARE

MOHAMMAD FIRDAUS BIN SAHDA

Thesis submitted in partial fulfilment of the requirements
for the award of the degree of
Bachelor of Chemical Engineering

Faculty of Chemical & Natural Resources Engineering
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JUNE 2015

SUPERVISOR'S DECLARATION

We hereby declare that we have checked this thesis and in our opinion, this thesis is adequate in terms of scope and quality for the award of the degree of Bachelor of Chemical Engineering.

Signature :
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Date :

STUDENT'S DECLARATION

I hereby declare that the work in this thesis is my own except for quotations and summaries which have been duly acknowledged. The thesis has not been accepted for any degree and is not concurrently submitted for award of other degree.

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Dedication

To my parents for their supports and unconditional love

ACKNOWLEDGEMENT

First of all, I want to express my gratitude to Allah the Sustainers of Life for giving me the strength and patience to complete this thesis. I wish to thank my parents, Mr Sahda Sulis and Madam Sariah Julaihi for the love and supports since I was born to this world. I also wish to thank my younger sister, Miss Nadia Hamni for her generosity and kindness to me. I wish to thank my supervisor and academic advisor, Dr. Ing Mohd Rizza Othman for his help and advices during this work. I wish to thank Mr. Chieng Thiew Hing an alumni of Universiti Malaysia Pahang (UMP) for his guidance on MOSAIC.I wish to thank Mr. Gregor Tolksdorf from Technische Universität Berlin for solving the errors in MOSAIC generated codes. I wish to thank Miss Jahirah Sazaly for her moral supports. Last but not least, I wish to thank Mr. Mohd Nazarni Che Isa, Mr. Muhd Naqiuddin Abdul Aziz, Mr. Muhd Hilman Ismail, Mr. Nazirul Mubin Md. Razin, Mr. Mohd Yazid Rashidi, Mr. Akmal Marmoh, Mr. Alif Amir Amri, Mr. Mohd Hafizezazmi Ajamain, Mr. Muhd. Mu'izzuddin Abd Malek, Mr. Muhd Al-Amir Mohd Zakuan, Mr Johari Nasir, Mr. Muhd Ehsan Hilmi, Mr. Dominick Gira, Mr. Paul Lawang Belayong, Mr Muhd Iman Mohd Salleh, Mr. Mohd Farhan Abu Samah, Mr. Akmal Abdul Aziz, Mr. Muhd Tarmizie Sufian and Mr. Mohd 'Afif Zainurin for their friendship and helps during my study at UMP.

ABSTRACT

This paper presents development of equilibrium model of vacuum distillation for benzene/toluene separation using MOSAIC software. The vacuum distillation process was modeled using MOSAIC software by key in the relevant equations and functions that related to vacuum distillation. The generated code from MOSAIC then transferred to MATLAB® environment to get the data for plotting the graph of temperature and composition profiles of vacuum distillation. The range of temperature in the vacuum distillation column was from 299 K to 318 K. The separation of benzene and toluene using vacuum distillation produce high purity of benzene at distillate which was 85 % of vapour mole fraction at distillate stream. Meanwhile, 92% of vapour mole fraction at bottom stream was toluene.

ABSTRAK

Tujuan kajian ini dibuat adalah untuk membangunkan model penyulingan vakum dalam keseimbangan bagi pemisahan benzene/toluene dengan menggunakan perisian MOSAIC. Proses penyulingan vakum dimodelkan dengan memasukkan persamaan dan fungsi yang berkaitan penyulingan vakum ke dalam perisian MOSAIC. Kod dihasilkan daripada MOSAIC kemudian dipindahkan ke persekitaran MATLAB® bagi mendapatkan data untuk memplot graf profil suhu dan komposisi penyulingan vakum. Julat suhu dalam ruang penyulingan vakum adalah dari 299 K hingga 318 K. Pemisahan benzena dan toluena menggunakan penyulingan vakum menghasilkan benzena berketulenan tinggi dimana 85 % daripada pecahan mol cecair pada aliran sulingan adalah benzena. Sementara itu, 92 % daripada pecahan mol cecair pada aliran bawah adalah toluena .

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NOMENCLATURE

F	Feed molar flow rate	mol/s
H	Enthalpy	J/mol
L	Liquid molar flow rate	mol/s
M_j	Molar liquid hold up on stage j	mol/s
P	Total pressure	Pa
P^o	Saturated vapour pressure	Pa
t	time	s
T	Temperature	K
V	Vapour molar flow rate	mol/s
x	Liquid composition	-
y	Vapour composition	-
z	Feed composition	-

Greek letters

ϕ	Fugacity coefficient	-
γ	Activity coefficient	-

Subscripts

i	Component number
j	Stage number

Superscripts

c	Total number of components

List of abbreviations

EQ	Equilibrium model
Bz	Benzene
Tol	Toluene
VD	Vacuum distillation

1 INTRODUCTION

1.1 Motivation and statement of problem

Vacuum distillation (VD) is actually an ordinary distillation but operate at lower pressure. The lowered pressure in distillation column reduces the boiling point of the components in the mixture. As the result, VD is commonly used in petrochemical industry to separate high boiling point hydrocarbon mixture. It also used to avoid cracking the long chain hydrocarbon if the mixture is subject to high temperature. Many researchers had produce various research to expand the application of vacuum distillation such as removal of impurities from crude nickel (Liu et al., 2012), removing lead from metallic mixture of waste printed circuit boards (X. Li, Gao, & Ding, 2013) batch operation for sulfuric acid recycling (Jung, Song, Park, Na, & Han, 2014), removal of impurities from crude lead with high impurities (Kong, Yang, Xiong, Liu, & Xu, 2014), separation of Sn-Sb alloy(Wang et al., 2014), recovery of titanium from the slurry formed in crude $TiCl_4$ (Xiang, Wang, Wang, & Chen, 2014), separation of elemental sulfur from zinc concentrate direct leaching residue (H. Li et al., 2014) and preparation of Te nano powder (Kim et al., 2014).Toluene and benzene are important chemicals because these chemical compounds are used as intermediate to produce other chemicals. Benzene for example is used to produce ethylbenzene, cumene and cyclohexane. Meanwhile, most of toluene converted to benzene and used to produce toluene diisocyanate (TDI).

The development and implementation of new models is hard and expensive task. This is because the complexity and low reusability of process models (Mangold, Motz, & Gilles, 2002). Although with existence advanced modeling in market, model formulation and configuration is still time consuming process in process modeling (Lam, Li, & Xu, 2007).

Modeling of vacuum distillation can be done by using available commercial software such as MatLab. This software requires the modeler to have extensive knowledge of process and prone to produce error due to long and complicated codes. Other software like AspenPlus is more to simulation of the chemical process rather than modeling and cannot be used to produce custom models.

The introduction of MOSAIC modeling software had been a great help for the modeler to create mathematical models for chemical processes. The unique feature such as latex enables the user to key in mathematical expression as close as possible to the literatures. Besides that, MOSAIC enables the code generation and translates it into different kinds of program code such as C++.

1.2 Objectives

The following are the objectives of this research:

- To explore the modelling of VD of benzene/toluene separation by using MOSAIC

1.3 Scope of this research

The following are the scope of this research:

i) Modelling of equilibrium(EQ) model of VD by using MOSAIC based on the given parameters of benzene/toluene separation

ii) Validation of the modelled VD with results from Aspen Plus

iii) Comparison between MOSAIC and other modelling environments.

2 LITERATURE REVIEW

2.1 Vacuum Distillation Column

2.1.1 General Introduction

Vacuum distillation (VD) is one of the separation unit found in refinery plant. The function of VD is to increases the amount of middle distillates and produces lubricating oil base stock and asphalt. VD is used to prevent cracking long chain hydrocarbons present in feed (Matar & Hatch, 2000).

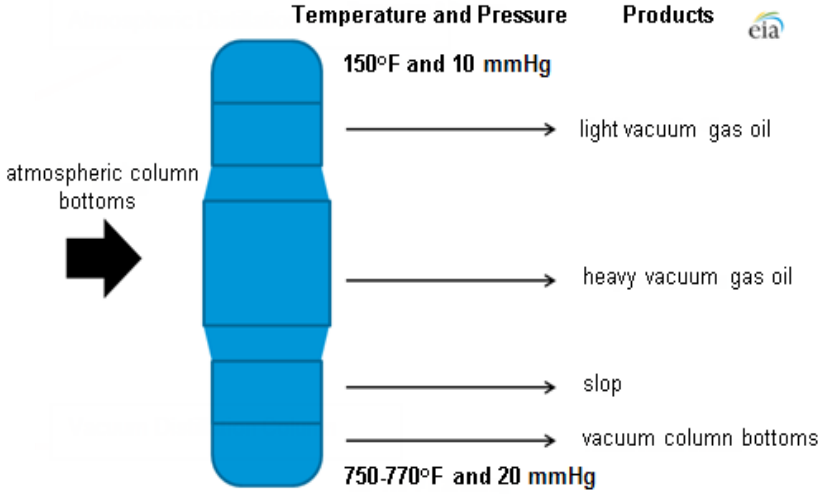

Figure 1: The products from VD in refining plant (U.S. Energy Information Administration, 2012)

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The working principles of VD is the boiling point of mixture will be decrease when the pressure is low. The lower boiling point that can achieve in VD compare to atmospheric distillation had made VD preferable as separation method for heat sensitive material such as foods, fruit juices, drugs and plant extracts.

2.1.2 Advantages of VD

Besides the reduction of boiling point of mixture, VD also increases the relative volatility. In vacuum condition materials are more volatile hence more evaporation takes place. More products will be collected at distillates, hence higher production rate.

By using VD, reduction of energy consumption can be achieved as the result of lower boiling point of mixtures. Atmospheric distillation column tends to use huge amounts of energy because of the evaporation process. According to Kunesh *et. al* (1995), the

reboilers of distillation columns use more than half of the process heat distributed to plant operations. So, VD is good separation alternative to reduce reboiler operating cost in plant.

The vacuum condition effect the position of azeotropic point for azeotropic mixture by shifting up the point. Hence, the separation of azeotropic mixture is easier when the vacuum condition is employed in distillation column (Repke & Klein, 2005).

2.1.3 The drawback of VD

Despite of few advantages of VD, this separation technique has the drawback of requiring large size of condenser. Vacuum condition reduce the vapour dew point, hence the condenser loses the driving force for heat transfer which is mean temperature difference (MTD). More surface area is needed for the condenser to work properly. As the result, the company has to pay high installation cost (Jung et al., 2014)

2.2 Benzene and Toluene

2.2.1 Global market of benzene and toluene

At present, the Asia-Pacific is the largest consumer of benzene and all of its downstream derivatives, which consumed more than 45.0% of the total consumption in 2012. Among all the countries, China dominates the benzene market, which consumed the maximum volume of benzene in 2012. The overall benzene demand is driven by the producers of ethylbenzene, cyclohexane, and cumene which consuming almost 82.0% of the total demand in 2012. Cumene manufacturing segment is expected to be the largest user of benzene which is primarily driven by growing demand for phenol and acetone (PRNewswire, 2014).

Throughout the world, consumption for toluene in virtually every region was negatively impacted by the economic recession in 2008 and/or 2009. The developed regions (North America and Western Europe) declined 8% and 17%, respectively. However, three regions increased their production of toluene over the same time frame—the Middle East, Northeast Asia and Southeast Asia. Since 2010, most regions have experienced growth. The fastest growing regions are Africa, the Indian Subcontinent and Northeast Asia.

However, demand in developing regions such as China, Thailand and the Middle East saw continued growth during this period. As global economies begin to slowly recover, toluene markets are anticipated to improve (IHS Chemical, 2013).

2.2.2 Application of benzene and toluene

Benzene and toluene are manufactured from fractions of crude oil distillation. Half of the benzene manufactured is used to produce ethylbenzene the raw material to make polystyrene. Another quarter is to produce cumene, which is then use to make phenol and acetone. Besides that, benzene is use to make cyclohexane, the important intermediate to make adipic acid and caprolactam. Meanwhile, over 50% of toluene produced is converted into benzene. Toluene is also used to make TDI (toluene diisocyanate), important chemical in production polyurethanes. In addition, toluene also widely used as solvent for alkyd polymers (University of York, 2014)

2.2.3 Benzene and Toluene Synthesis

Nowadays, 80 % of benzene and toluene are primarily produced via:

1. Steam cracking of naphtha
2. Catalytic reforming of naphtha

Small amount of benzene which is about 20 % are produced from toluene using:

1. dealkylation
2. disproportionation (University of York, 2014)

2.3 Equilibrium MODEL of VD

2.3.1 Assumptions of VD Models

There is no available model for benzene/toluene vacuum distillation column but the assumptions made by Kulkarni (1995) for xylene/toluene column can be used as guidance. These assumptions were:

1. Each tray is a sieve tray.
2. Vapour holdup on each tray is negligible.
3. Liquid holdup on each tray varies with time.
4. Due to lower pressure, ideal gas behaviour describes the vapour phase.
5. Raoult's law describes the vapour-liquid equilibrium (VLE) relationship.

6. Sensible heat changes on each tray are negligible.
7. Negligible secondary heating effects due to mixing.
8. Reflux from the accumulator is a saturated liquid.
9. The reboiler is an equilibrium stage,
10. All vapour is condensed in the condenser.

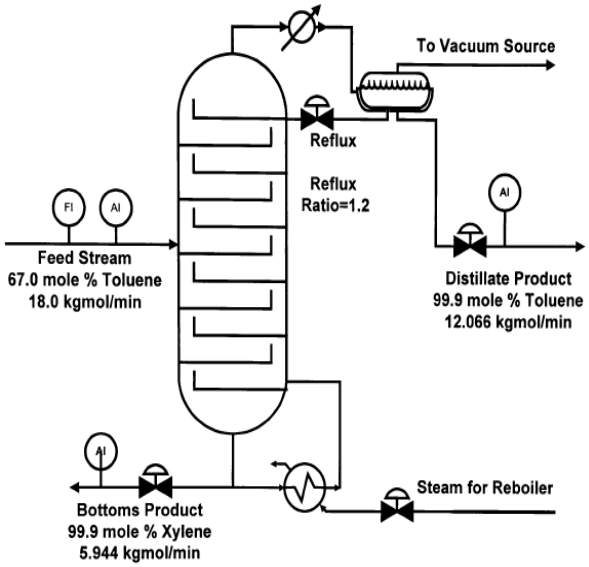

Figure 2: Xylene/Toluene High Purity Distillation Column (Anderson, 1998)

2.3.2 Mathematical Modelling of EQ

The first step of modelling begins with mathematical modelling by formulation of equations to describe processes occurring in RD at the steady state. These formulated equations or just MESH equations will be required in finding solution of the model. The letters of MESH stand for material balance equations, phase equilibrium equations, summation equations and heat balance equations.

Material balance equations

The material balance of every stages of VD can be represented by equation as follow:

Overall material balance

$$\frac{dM_j}{dt} = F_j - L_j - V_j + V_{j+1} + L_{j-1} + \delta_j R_j$$

Components material balance

$$\frac{dM_j x_{j,i}}{dt} = F_j z_{j,i} - L_j x_{j,i} - V_j y_{j,i} + V_{j+1} y_{j+1,i} + L_{j-1} x_{j-1,i} + \delta_j \sum_{r=1}^{R} \left(v_{i,r} r_{j,r} \right)$$

(Murat, Mohamed, & Bhatia, 2003)

Since the model is assumed as steady state, and thus the derivative of material balance will be equal zero. Both j and i are subscripts to represent the stages numbers and components respectively. F represents feed flow rate, L represents liquid flow rate then V will represent vapour flow rate. x and y are the mole fraction of liquid and vapour respectively.

Furthermore, for integrated reactive part of equation, r represents the reaction rate and v represents the stoichiometry of chemical components. The value of δ will be either 0 or 1 to decide whether reaction occurring at the stages or not. As there is no reaction in column, the integrated reactive part and the value of δ are assigned zero.

Phase equilibrium equations

$$y = \frac{\gamma P^o x}{\phi P}$$

Phase equilibrium relation equation describes the relationship between liquid mole fraction and vapour mole fraction of chemical components when vapour and liquid at equilibrium state. For the ideal condition, the value of activity coefficient, γ and fugacity, ϕ will be equal to 1. Saturated vapour pressure, P^o can be calculated using of Antoine equation and P is pressure of reactive distillation column.

Summation equations

$$\sum_{i}^{c} x_{j,i} = 1.0 \qquad \text{(Liquid phase)}$$

$$\sum_{i}^{c} y_{j,i} = 1.0 \qquad \text{(Vapour phase)}$$

From the summation equation, it states that sum of mole fraction of each component in liquid phase and vapour phase of each stage will be equal to 1.

Enthalpy balance equations.

The energy balance of each stages of VD can be described by equation as follow

$$\frac{dH_j}{dt} = F_j H^F + L_{j-1} H^L_{j-1} + V_{j+1} H^V_{j+1} - V_j H^V_j - \delta_j \sum_{r=1}^{R} \left(\Delta H^R_{j,r} \right) r_{j,r}$$

(Murat et al., 2003)

Again, for the steady state, the derivative of energy balance will be equal to zero. The reactive part of the equation, ΔH is enthalpy change of chemical reaction, r is the rate of reaction and δ will decide whether the reaction taking place at each stages or not. The summation of enthalpy change can be ignored as there is no reaction occurs in the column.

2.4 MOSAIC

2.4.1 Introduction

MOSAIC is web-based modelling environment that ease the modelling works by:

1. Minimizing the modelling errors.
2. Minimizing the programming effort.
3. Avoiding the errors in documentation.

Encouraging and supporting the cooperative work.(Kuntsche, Barz, Kraus, Arellano-Garcia, & Wozny, 2011)

2.4.2 Advantages of Using MOSAIC

One of the sources of error in programming of models is the visual difference between mathematical expressions in documentation and the calculation expression in program code. In MOSAIC modelling environment, this type of error is minimized by defining the model equations directly in two-dimensional mathematic expressions. The use of documentary language standard such as Latex is a good way to define model equations in mathematic symbolic language.

MOSAIC software has versatile code generation functionality. The output of MOSAIC is program code that can be use as a solution for simulations problems. The models created using MOSAIC are independent from programming languages thus can be used as input for other modelling tool software.

As the MOSAIC is web based software, model data base can be access over the internet. The data base contain both the model related equations, equation systems and calculation studies and the necessary data like simulation results, measurement data for

model validation, and meta information. These features offer the reusability of the models created by the various developers.

2.5 Summary

The implementation of VD for separation purpose had brought many benefits in chemical, food, pharmaceutical and waste treatment industry. The ability of VD to separate mixture at lower temperature than atmospheric distillation makes it suitable for heat sensitive materials such as plant extract, protein and polymers.

3 METHODOLOGY

3.1 Conditions for Benzene/Toluene VD Column

3.1.1 Assumptions Used In Modelling

The feed that enter the VD column can be assumed to contain only benzene and toluene. In real situation, the feed usually contain other long chain carbon groups and aromatics. As the concentration of these components is low it can be neglect.

3.1.2 Conditions of Benzene/Toluene Separation

The data used for modelling the benzene/toluene VD were taken from xylene/toluene column as it has close chemical and physical properties. The distillate flow rate is 12.066 kmole/min. The feed temperature is 95 °C and entered at tray number 24 from bottom. There are 49 trays with column diameter of 3.962 m (Anderson, 1998).

3.2 Procedure of using MOSAIC

Step 1: Creating of notation

The symbols with description are created in notation to represent the variables of equations. Each variable can be represented by base name alone or together with subscripts and superscripts. A notation can be valid for an entire model or only a small portion of it. By introducing of subscripts and superscripts, it allows two or more variables to have similar base name. Besides the creating of symbols for each variable, the indices required for modelling are created as well in notation.

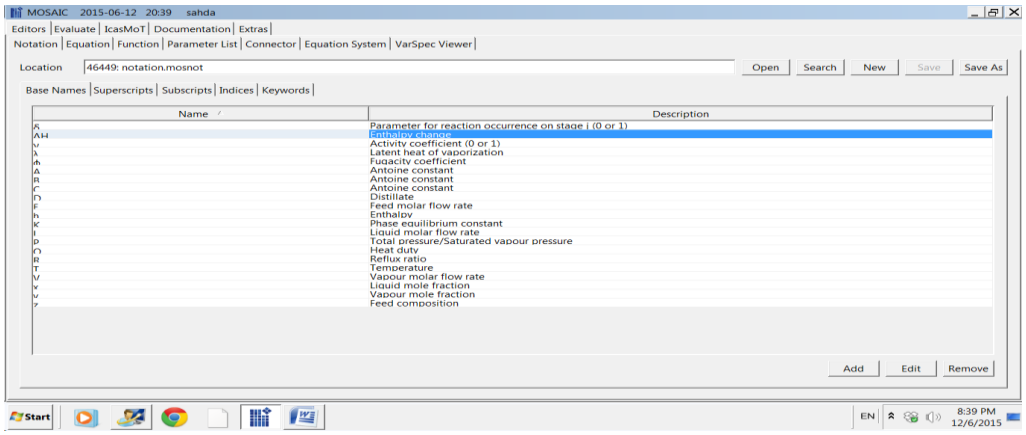

Figure 3: Generating of notation

Step 2: Creating of equation objects

The modelling equations can be created by using of Latex. Latex is a documentary language which allows equations to be expressed in documentation level. Other than basic equation systems, MOSAIC only supports differential algebraic equation systems of first order at the moment (Esche et al., n.d.).

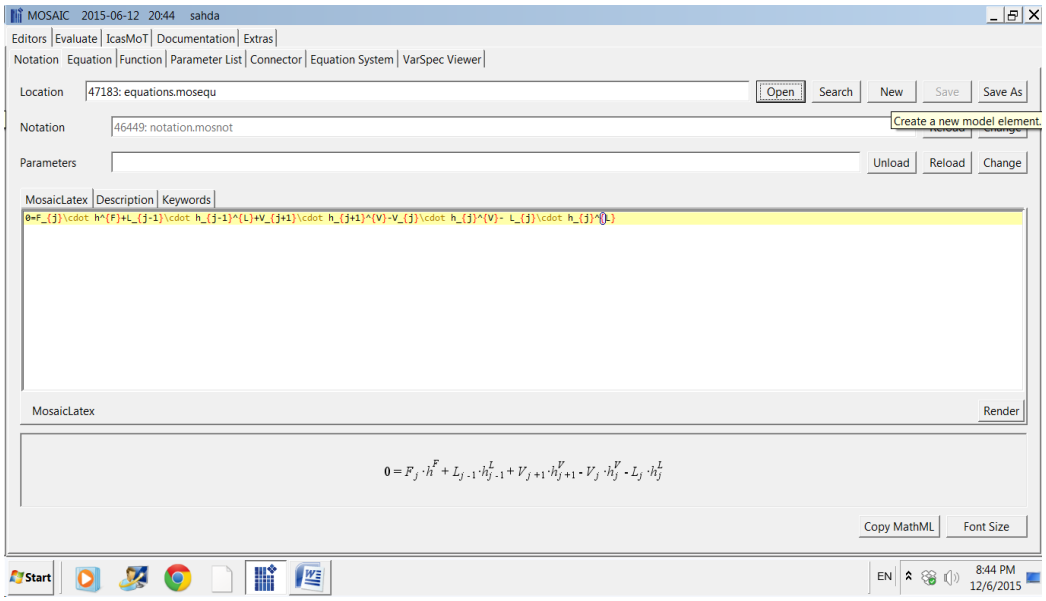

Figure 4: Generating of equation

Step 3: Creating of functions objects

Almost same as creating of equation objects, function objects are created by using Latex as well. However, the method of creating functions is not as simple as creating of equations. It may require creating of parameter list object if involving in parameter set index. Parameter set index allows users to set the index on output variable and parameters. The specification of output variable and input variables will be required. The output variable will be the variable that is calculated while the input variables are almost similar as design variables where the setting of its values will be required. Lastly, the formula which leads to output variable will be written in form of Latex.

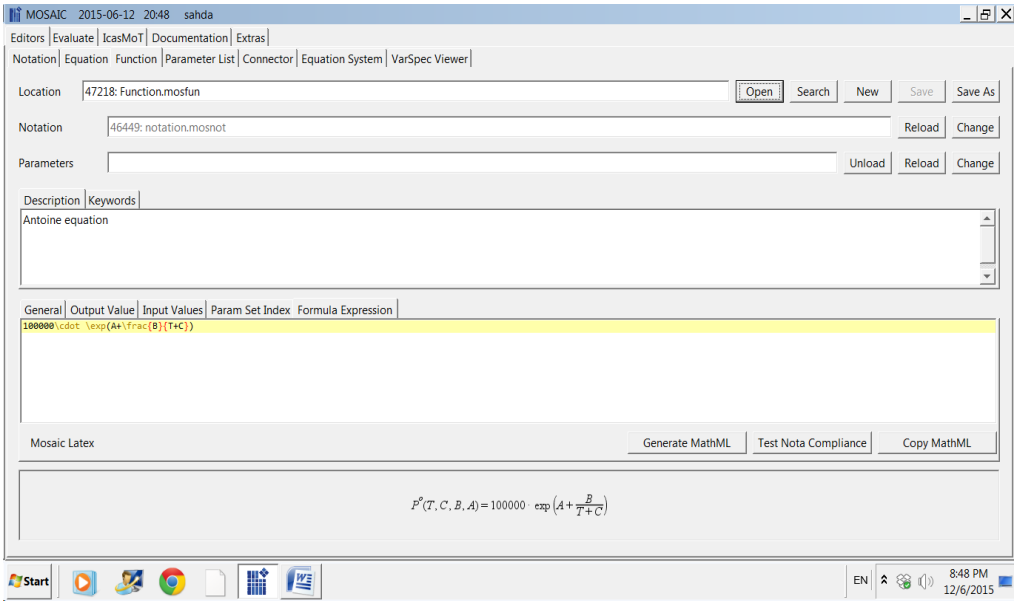

Figure 5: Generating of function

Step 4: Creating of equation system

All equations and functions of a model are connected by equation system for evaluation. Adding of equations to equation system can be done easily, but for adding of functions, it is required to set the output variables and input variables. Preview of all the added equations and functions in equation system can be made.

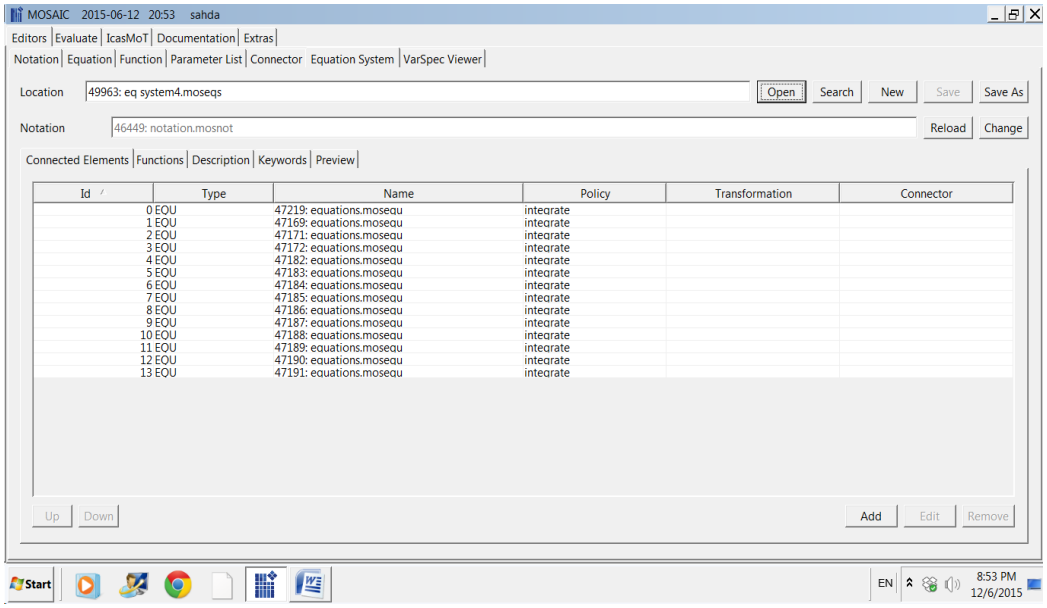

Figure 6: Process of adding modelling equations

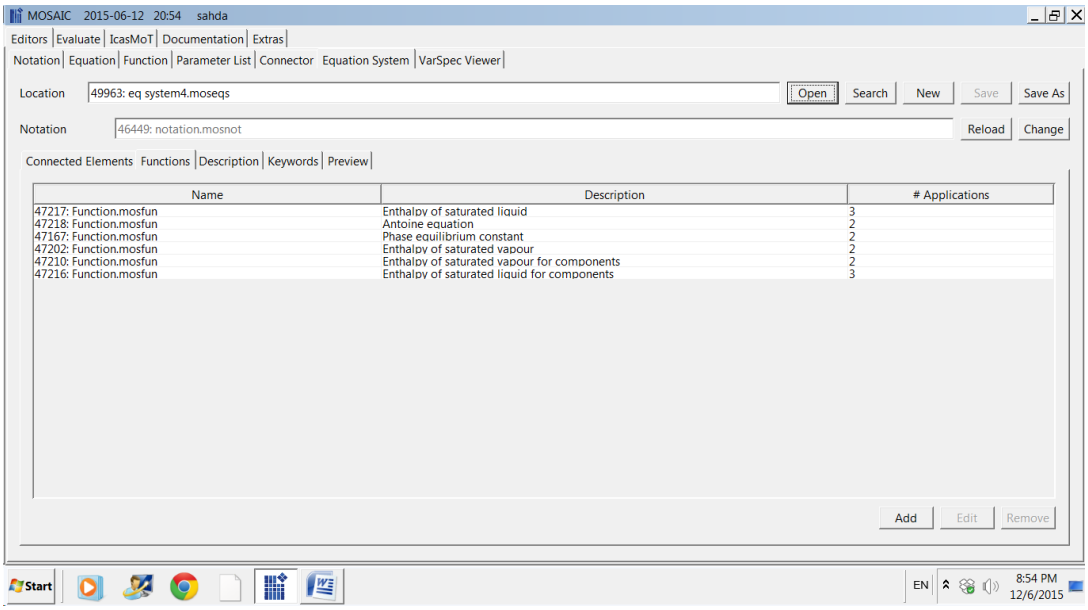

Figure 7: Process of adding modelling functions

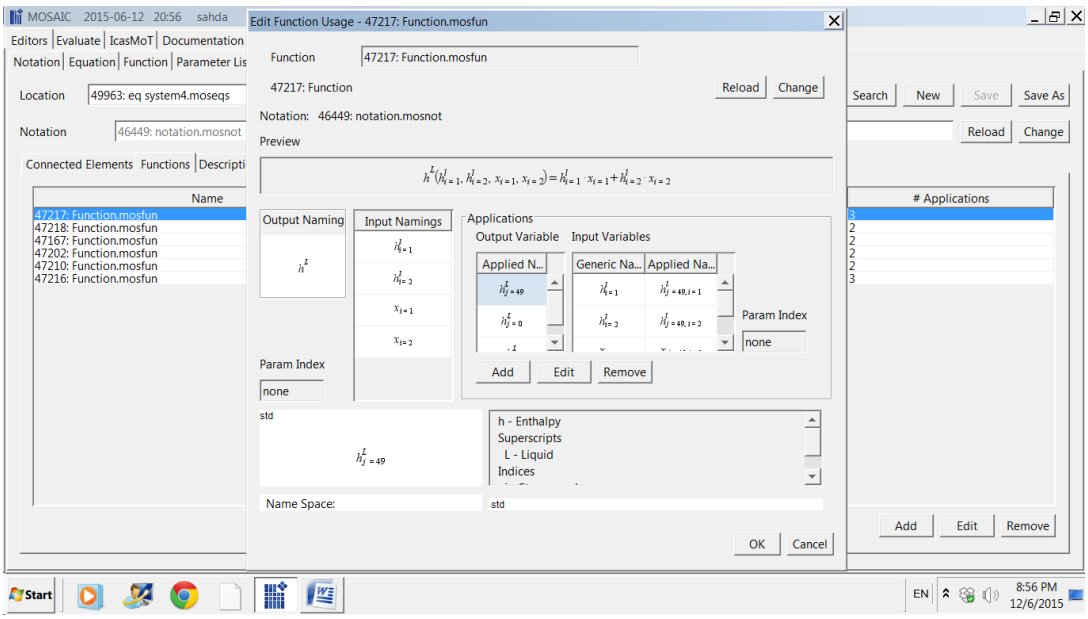

Figure 8: Process of adding the functions of applications

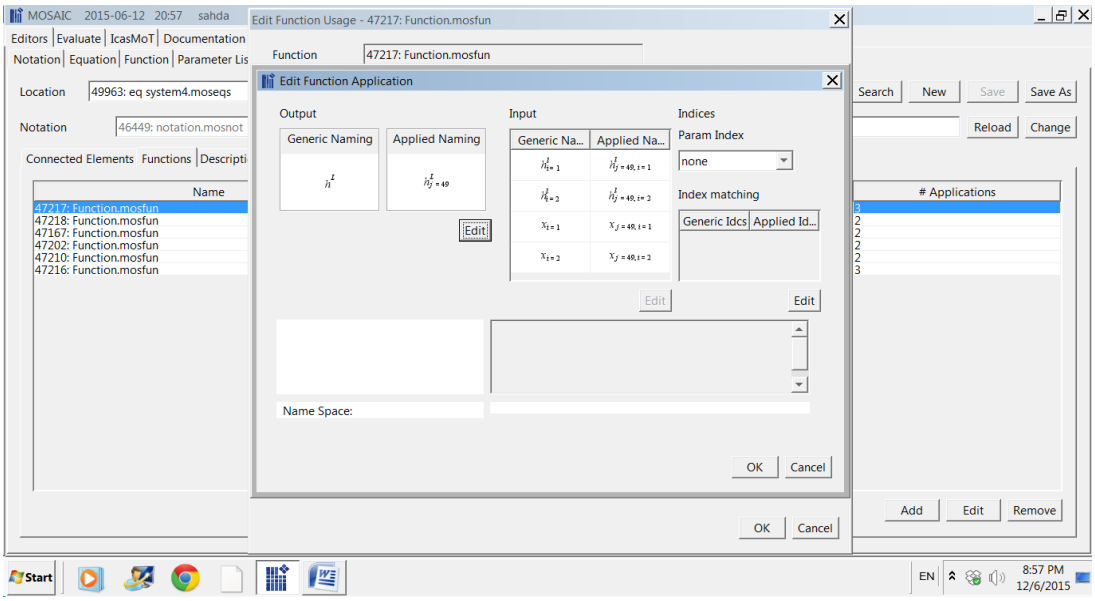

Figure 9: Process of setting the input variables

Step 5: Creating of evaluation object

In order to create the evaluation object, the equation system first has to be loaded. Once it is loaded, indexing can be made by specifying the max value of each index. After indexing, all the equations and functions involved in modelling can be displayed.

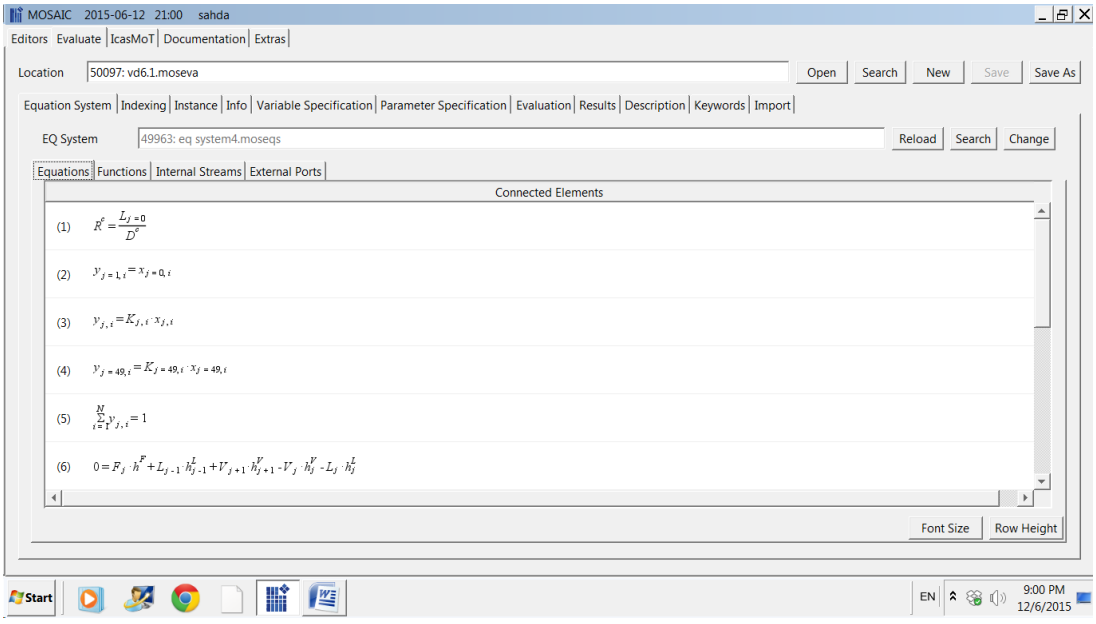

Figure 10: Preview of equation system

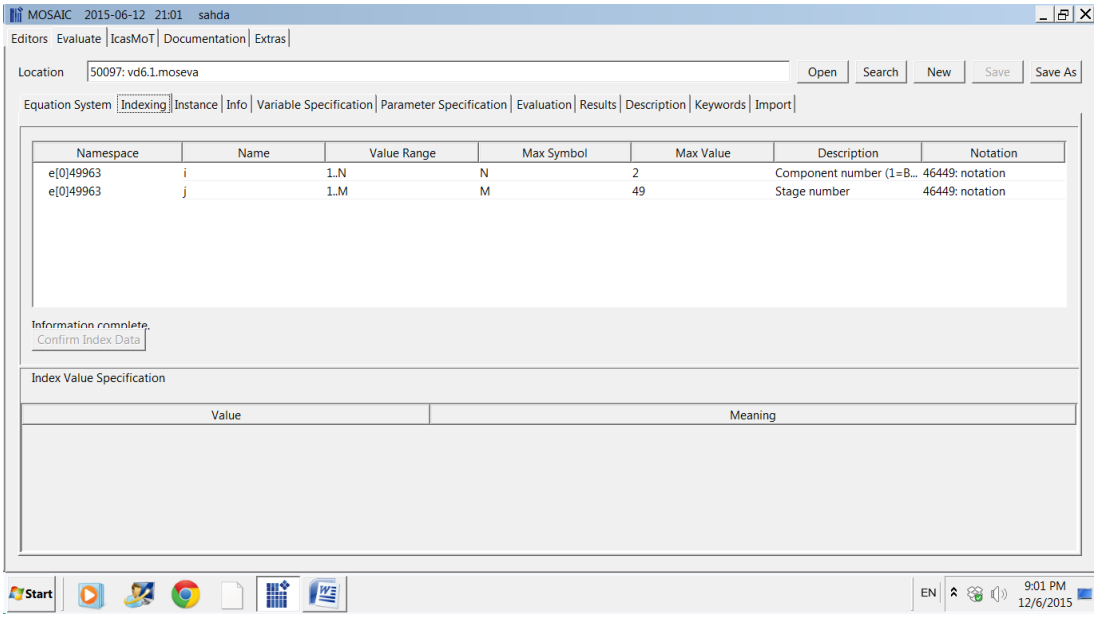

Figure 11: Process of setting the index number

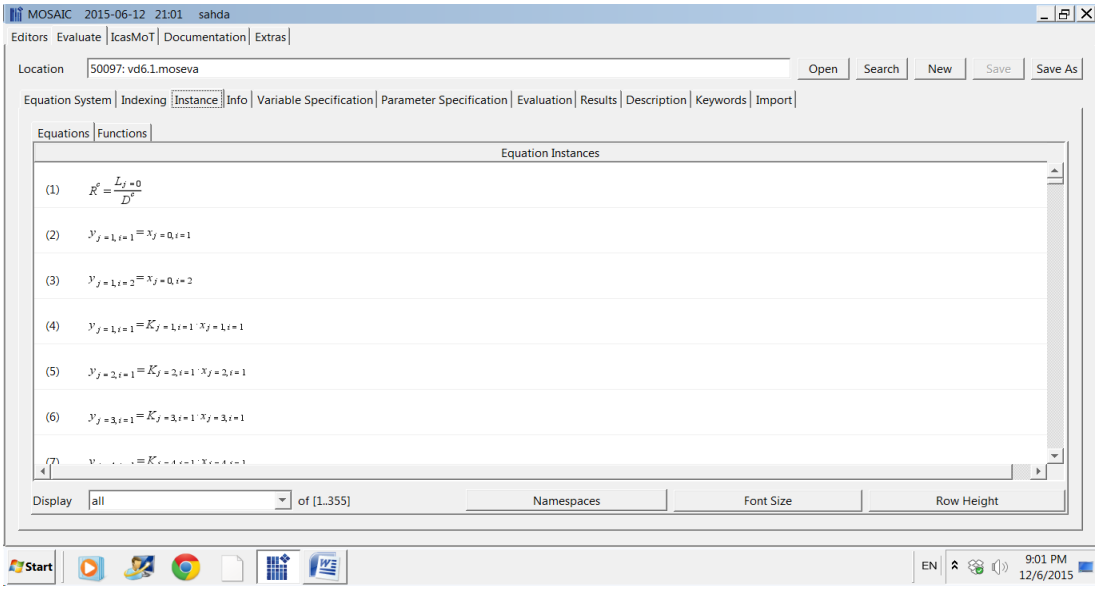

Figure 12: Preview of modelling equations after indexing

Step 6: Creating of parameter object

Specifications of variables are now ready to be made by assigning the variables as iteration variables or design variables. The degree of freedom will be automatically calculated when assigning of variables. In order to solve the model, degree of freedom must be zero. Once it is done, the value of each design variables is given for calculation. Furthermore, good initial values of iteration variables are important in solving of model.

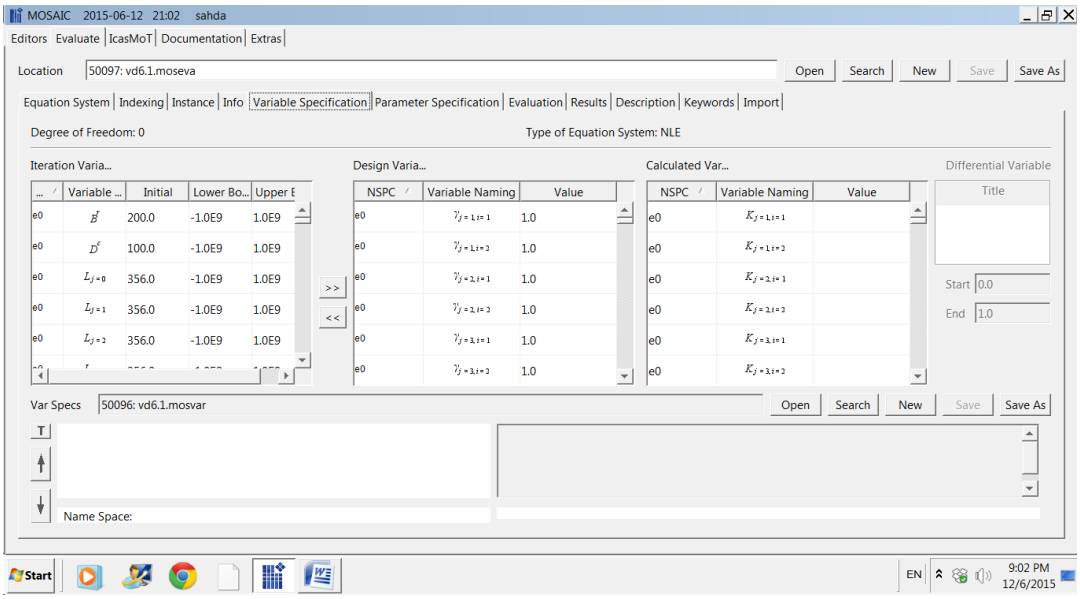

Figure 13: Process of setting variable specification

Step 7: Code generation and evaluation

MOSAIC is not designed to be full solver as it is not able to solve complex models. The solving of model can be made by code generation for other modelling environments. The generated codes can be run at their own environment for the solving of model.

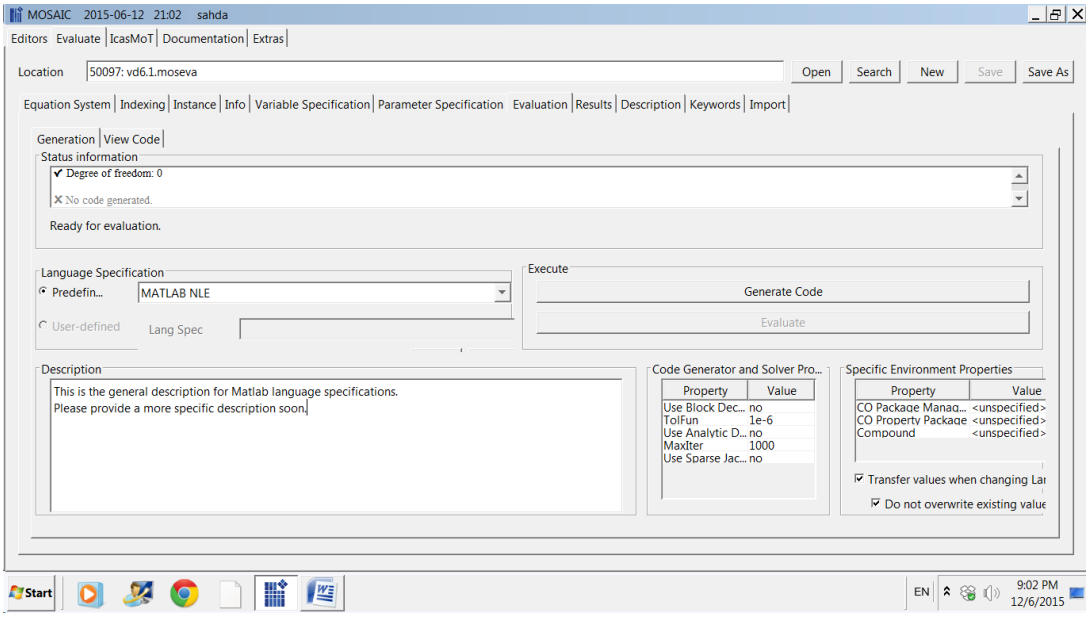

Figure 14: Process of generating code

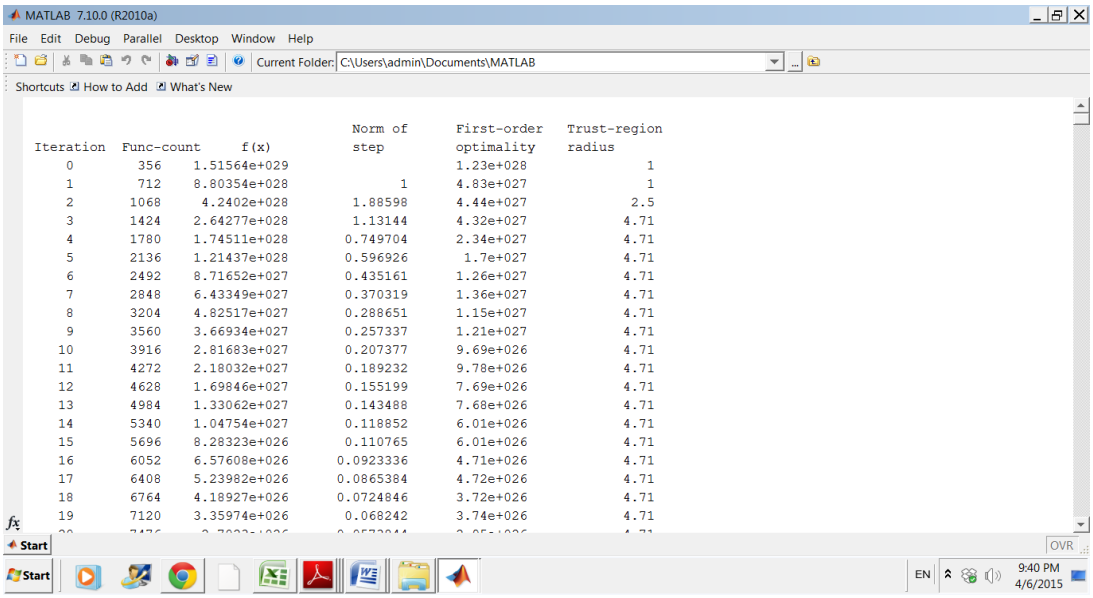

Figure 15: Process of solving generated code in MATLAB environment

4 RESULTS AND DISCUSSION

4.1 Result and Discussion

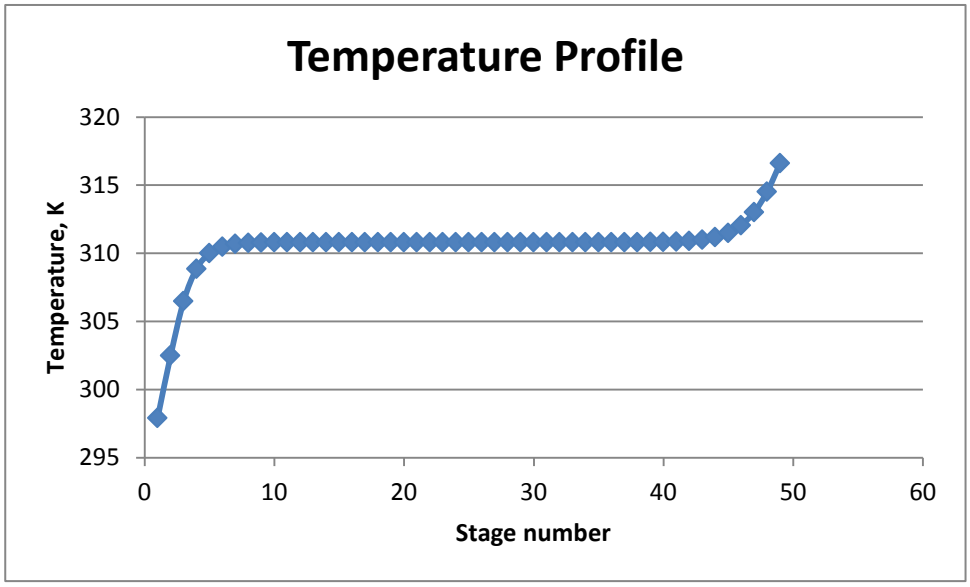

Figure 16: Temperature versus stage number

Based on Figure 16, the temperature at stage number 49 which is at condenser was at 299 K while the temperature at reboiler was at 318 K. The temperature is raise from stage 1 until stage 6. After that the temperature almost constant from stage number 7 to stage number 45 which is at 311 K. At the end of stage, the temperature raise until it reach 318 K at reboiler. Vacuum condition in distillation column has caused the benzene and toluene vaporise immediately as the boiling points for both components were lowered beneath the normal boiling point of 353 K and 384 K which were 298 K and 323 K (Hodgman, 1963) respectively.

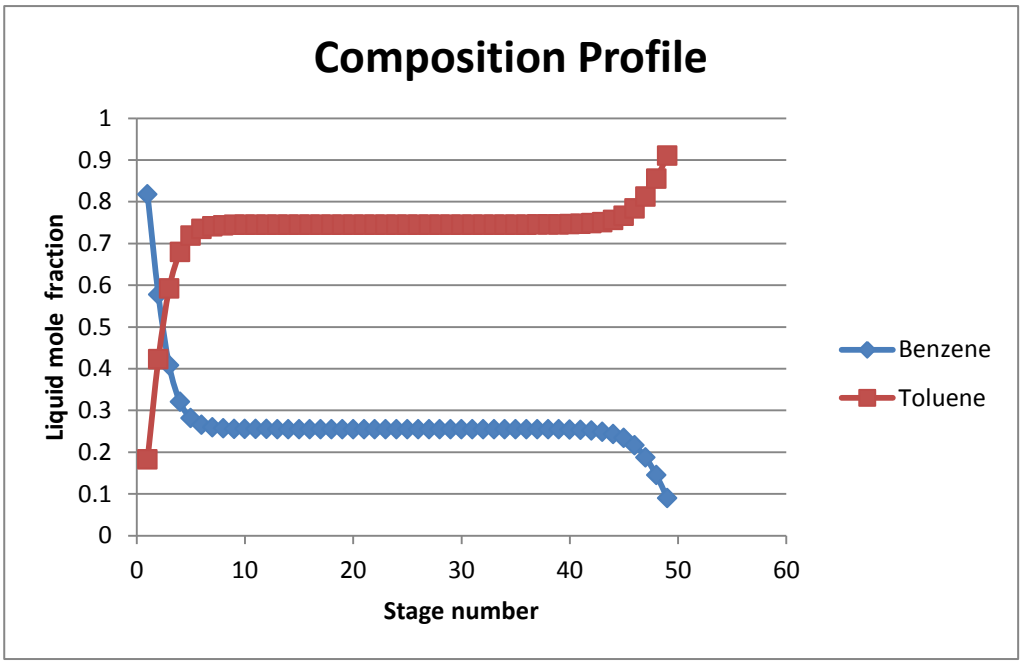

Figure 17: Vapour mole fraction versus stage number

From Figure 17, the liquid fraction of benzene keeps increasing from bottom (stage 49) to top of the column (stage 1). Meanwhile, the liquid fraction of toluene gradually decreases from top (stage 1) to bottom of column (stage 49). This can be explained by the higher volatility of benzene compare to toluene. At the condenser, the liquid mole fraction of benzene and toluene were 0.85 and 0.15 respectively. In other hand, the liquid mole fraction of benzene and toluene at bottom were 0.08 and 0.92 respectively.

The vacuum condition that occurred in the column reduces the heat duty of boiler. However, vacuum distillation also creates problem for condenser to condense the hot gases because lower pressure also mean lower dew points for benzene and toluene. Larger condenser size was needed to overcome this problem because as the vapour dew point decreases, the condenser loses the driving force for heat transfer; mean temperature difference (MTD). The required condenser surface area increases with a decrease in MTD (Jung et al., 2014).

4.2 Comparison with Expected Results

Table 1: Comparison between Aspen Plus column and simulation result

		Aspen Plus result		*MOSAIC result*	
Quantity	Units	Top	Bottom	Top	Bottom
x_{Bz}		0.82	0.09	0.85	0.08
x_{Tol}		0.18	0.91	0.15	0.92
Temperature	K	298	316	299	318
Benzene flow	mol/s	81.18	18.09	82.50	16.08
Toluene flow	mol/s	17.82	182.91	19.00	184.92
Benzene purity	%	82	-	81	-

From Table 1, it can be seen that the value of liquid mole fraction, mole flow rate and temperature of the components were not differ very much. It shows that the MOSAIC model has represented accurately the physical phenomena in vacuum distillation.

4.3 Comparison between MOSAIC and other modelling environments

Two Main Groups of Modelling Software

They are two different groups of commercial software tools for the solution of mathematical models. The first group provides readymade computer models, hence restricted in their transparency like AspenPlus and CHEMCAD. The second group provides a modeling environment based on tailored programming languages, hence have the advantage of transparency and free manipulation such as gProms, Aspen Custom Modeler (ACM), and GAMS. Symbolic mathematic expressions are created by using latex. In addition, MOSAIC enables the code generation and translates it into different kinds of program code such as C++. The user also can use other software tools or other documentation-level languages as input for MOSAIC (Kuntsche et al., 2011).

Table 2: Comparison of MOSAIC with other modelling software

Criteria	MOSAIC	Equation oriented modelling	Notes
Modelling at documentation level	Available	Not available	Modelling by using MOSAIC can be done at documentation level. Since the equations are written in Latex documentary language, it has similar readability as documentation level. In addition, coding is not required for modelling using MOSAIC.
Reuse of model elements	Available	Partially available	The reuse of model elements by MOSAIC is more systematic and organized. The model elements can be saved in folder. Hence, the users can either reuse the notation, equations, functions and variables specification easily.
Code generation	Available	Not complete	Code generation of MOSAIC are much more complete. MOSAIC allows users to generate the code based on preferred computer programming languages. Thus allowing the model to be run on various modelling environments.
Centralised internet database capability	Available	Not available	As the database of MOSAIC can be access online, it allows users to share their works on internet more easily. The shared work can be viewed or modified by other users whom have been granted access by the original user.
Degree of freedom analysis	Available	Not available	Degree of freedom analysis can be done automatically by MOSAIC. In order to evaluate the generated code, degree of freedom must be zero. Hence, it is necessary for the model to have equal amount of equations and unknowns.
Error identification	Excellent	Difficult	Since modelling by MOSAIC is written in Latex documentary language, it has high readability. Hence, users can identify the errors more easily if they are making mistakes while key in modelling equations.
Language	Documentary level	Programming level	MOSAIC is using Latex documentary language in writing of modelling equations. Latex has high readability, unlike programming language, it is difficult to read and understand the lengthy and complex coding.
Difficulty	Medium	Hard	Although without knowledge of coding in modelling, MOSAIC still allows users to do modelling with less effort. The stages of modelling using MOSAIC are systematic and can be followed by the user.The most difficult part will be creating of functions, however it can be solved easily once users know how it works.
Transparency of model	Excellent	Excellent	All equations involved in modelling can be track by the users. Besides that, the value of variables also can be determined and set by the user.

Building of customised model	Capable	Capable	MOSAIC is similar to software like Matlab which enable the user to create their own customised model.

5 CONCLUSION

5.1 Conclusion

MOSAIC software helps the modeller to create mathematical model without out the need to understanding any computer programming language. The main features in MOSAIC that allows this to happen is the usage of Latex. Latex enables user to create modelling equations at documentation level. As the result, it has excellent readability which is very useful for error identification and user friendly.

In addition, MOSAIC offers the reusability of model elements such notations, equations, function and variable specification. This feature helps the modeller to save time and efforts. The fact that MOSAIC has online database allow the users to share the models with each other.

5.2 Recommendation

Modelling of chemical engineering unit operations using MOSAIC is more systematic and hassle free. The high readability of mathematical equations reduces the errors during modelling. The vacuum distillation model produced can be improved by taking into the account the pressure drop between each stage to get more accurate temperature profile.

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APPENDICES

I. Notation of VD Model

Base names:	Description	Units
ΔH	Enthalpy change	J/mol
&gamma;	Activity coefficient (0 or1)	
&lambda;	Latent heat of vaporization	J/mol
&phi;	Fugacity coefficient	
A	Antoine constant	
B	Antoine constant	
C	Antoine constant	
D	Distillate	mol/s
F	Feed molar flow rate	mol/s
K	Phase equilibrium contstant	
L	Liquid molar flow rate	mol/s
P	Total pressure/Saturated vapour pressure	Pa
Q	Heat duty	J/mol
R	Reflux ratio	
T	Temperature	K
V	Vapour molar flow rate	mol/s
h	Enthalpy	J/mol
x	Liquid mole fraction	
y	Vapour mole fraction	
z	Feed composition	

Superscripts:	
F	Feed
L	Liquid
V	Vapour
b	Normal latent heat of vaporization/boiling point
c	Condenser/Critical temperature
l	Component's liquid
o	Saturated / Initial
r	Reboiler
v	Component's vapour

Indices:	
i | maxVal: N	Component number (1=Bz, 2=Tol)
j | maxVal: M	Stage number

II. Equations of VD Model

Reflux ratio

MosaicLatex:

R^{c}=\frac{L_{j=0}}{D^{c}}

Equivalent of liquid and vapour mole fraction

MosaicLatex:

y_{j=1,i}=x_{j=0,i}

Phase equilibrium

MosaicLatex:

y_{j,i}= K_{j,i} \cdot x_{j,i}

Phase equilibrium of reboiler

MosaicLatex:

y_{j=49,i}=K_{j=49,i} \cdot x_{j=49,i}

Summation of vapour fraction

MosaicLatex:

\sum_{i=1}^{N}{y_{j,i}}=1

Energy balance

MosaicLatex:

0=F_{j}\cdot h^{F}+L_{j-1}\cdot h_{j-1}^{L}+V_{j+1}\cdot h_{j+1}^{V}-\delta_{j}\cdot \Delta H\cdot r_{j}-V_{j}\cdot h_{j}^{V}- L_{j}\cdot h_{j}^{L}

Energy balance of reboiler

MosaicLatex:

B^{r}\cdot h^{L}_{j=49}=L_{j=15}\cdot h^{L}_{j=48}-V_{j=49}\cdot h^{V}_{j=49}+Q^{r}

Material balance

MosaicLatex:

0=F_{j}\cdot z_{i}-L_{j}\cdot x_{j,i}-V_{j}\cdot y_{j,i}+V_{j+1}\cdot y_{j+1,i}+L_{j-1}\cdot x_{j-1,i}+\delta_{j}\cdot v_{i}\cdot r_{j}

Energy balance of condenser

MosaicLatex:

V_{j=1}\cdot h^{V}_{j=1}=h^{L}_{j=0}\cdot (L_{j=0}+D^{c}) + Q^{c}

Summation of vapour fraction for reboiler

MosaicLatex:

\sum_{i=1}^{N}{y_{j=49,i}}=1

Material balance of reboiler

MosaicLatex:

B^{r}\cdot x_{j=49,i}=L_{j=48}\cdot x_{j=48,i}-V_{j=49}\cdot y_{j=49,i}

Material balance of condenser

MosaicLatex:

V_{j=1}=L_{j=0}+D^{c}

Summation of liquid fraction

MosaicLatex:

\sum_{i=1}^{N}{x_{j,i}}=1

Summation of liquid fraction for reboiler

MosaicLatex:

\sum_{i=1}^{N}{x_{j=49,i}}=1

III. Functions of VD Model

Functions	Output Value	Input Value	Param Set Index
Phase equilibrium constant	K	\gamma, P^{o}, P, \phi	none

Formula Expression

\frac{P^{o}\cdot \gamma}{P\cdot ϕ

Applied as

K_{j=49,i}=(\gamma_{j=49,i},P_{j=49,i}^{o},P,\phi)
K_{j,i}=(\gamma_{j,i},P_{j,i}^{o},P,\phi)

Enthapy of saturated vapour	h^{V}	h_{i=1}^{v},h_{i=2}^{v}, y_{i=1}, y_{i=2}	none

Formula Expression

h^{v}_{i=1}\cdot y_{i=1}+h^{v}_{i=2}\cdot y_{i=2}

Applied as

h_{j}^{V}=(h_{j,i=1}^{v}, h_{j,i=2}^{v},y_{j,i=1},y_{j,i=2})
h_{j=49}^{V}=(h_{j=49,i=1}^{v},h_{j=49,i=2}^{v},y_{j=49,i=1},y_{j=49,i=2})

Enthapy of saturated vapour for components	h^{v}	T, \lambda^{b}, A^{L}, B^{L}, C^{L}, T^{b}, T^{c}	none

Formula Expression

(A^{L}\cdot T + \frac{B^{L}}{2}\cdot (T)^{2} + \frac{C^{L}}{3}\cdot (T)^{3})-(A^{L}\cdot 298 + \frac{B^{L}}{2}\cdot (298)^{2} + \frac{C^{L}}{3}\cdot (298)^{3})+\lambda^{b} \cdot (\frac{T^{c}-T}{T^{c}-T^{b}})^{0.38}

Applied as

h_{j=49,i}^{v}=(T_{j=49},\lambda_{i}^{b},A_{i}^{L},B_{i}^{L},C_{i}^{L},T_{i}^{b},T_{i}^{c})
h_{j,i}^{v}=(T_{j},\lambda_{i}^{b},A_{i}^{L},B_{i}^{L},C_{i}^{L},T_{i}^{b},T_{i}^{c})

Enthapy of saturated liquid for components	h^{l}	T, C^{L}, B^{L}, A^{L}	none

Formula Expression

(A^{L}\cdot T + \frac{B^{L}}{2}\cdot (T)^{2} + \frac{C^{L}}{3}\cdot (T)^{3})-(A^{L}\cdot 298 + \frac{B^{L}}{2}\cdot (298)^{2} + \frac{C^{L}}{3}\cdot (298)^{3})

Applied as

h_{j=49,i}^{l}=(T_{j=49},C_{i}^{L},B_{i}^{L},A_{i}^{L})
h_{j=0,i}^{l}=(T_{j=0},C_{i}^{L},B_{i}^{L},A_{i}^{L})
h_{j,i}^{l}=(T_{j},C_{i}^{L},B_{i}^{L},A_{i}^{L})

Enthapy of saturated liquid	h^{L}	h_{i=1}^{l}, h_{i=2}^{l}, x_{i=1}, x_{i=2}	none

Formula Expression

h^{l}_{i=1}\cdot x_{i=1}+h^{l}_{i=2}\cdot x_{i=2}

Applied as

h_{j}^{L}=(h_{j,i=1}^{l},h_{j,i=2}^{l},x_{j,i=1},x_{j,i=2})

h_{j=49}^{L}=(h_{j=49,i=1}^{l},h_{j=49,i=2}^{l},x_{j=49,i=1},x_{j=49,i=2})
h_{j=0}^{L}=(h_{j=0,i=1}^{l},h_{j=0,i=2}^{l},x_{j=0,i=1},x_{j=0,i=2})

Antoine equation	P^{o}	T, C, B, A	none

Formula Expression

100000\cdot \exp(A+\frac{B}{T+C})

Applied as

P_{j=49,i}^{o}=(T_{j=49},C_{i},B_{i},A_{i})
P_{j,i}^{o}=(T_{j},C_{i},B_{i},A_{i})

IV. Variable Specification

Iteration variables:	**Value**	**Design variables:**	**Value**
B^{r}	200.0	A_{i=1}^{L}	-6.2106
D^{c}	100.0	A_{i=1}	15.9008
L_{j=0}	500.0	A_{i=2}^{L}	125.8
L_{j=1}	500.0	A_{i=2}	16.0137
L_{j=2}	500.0	B_{i=1}^{L}	0.565
L_{j=3}	500.0	B_{i=1}	2788.51
L_{j=4}	500.0	B_{i=2}^{L}	0.0565
L_{j=5}	500.0	B_{i=2}	3096.52
L_{j=6}	500.0	C_{i=1}^{L}	-3.141E-4
L_{j=7}	500.0	C_{i=1}	-52.36
L_{j=8}	500.0	C_{i=2}^{L}	1.3593E-4
L_{j=9}	500.0	C_{i=2}	-53.67
L_{j=10}	500.0	F_{j=1}	0.0
L_{j=11}	500.0	F_{j=2}	0.0
L_{j=12}	500.0	F_{j=3}	0.0
L_{j=13}	500.0	F_{j=4}	0.0
L_{j=14}	500.0	F_{j=5}	0.0
L_{j=15}	500.0	F_{j=6}	0.0
L_{j=16}	500.0	F_{j=7}	0.0
L_{j=17}	500.0	F_{j=8}	0.0
L_{j=18}	500.0	F_{j=9}	0.0
L_{j=19}	500.0	F_{j=10}	755.0
L_{j=20}	500.0	F_{j=11}	0.0
L_{j=21}	500.0	F_{j=12}	0.0
L_{j=22}	500.0	F_{j=13}	0.0
L_{j=23}	500.0	F_{j=14}	0.0
L_{j=24}	500.0	F_{j=15}	0.0
L_{j=25}	500.0	F_{j=16}	0.0
L_{j=26}	500.0	F_{j=17}	0.0
L_{j=27}	500.0	F_{j=18}	0.0
L_{j=28}	500.0	F_{j=19}	0.0
L_{j=29}	500.0	F_{j=20}	0.0
L_{j=30}	500.0	F_{j=21}	0.0
L_{j=31}	500.0	F_{j=22}	0.0
L_{j=32}	500.0	F_{j=23}	0.0
L_{j=33}	500.0	F_{j=24}	0.0
L_{j=30}	500.0		
L_{j=31}	500.0		
L_{j=32}	500.0	F_{j=25}	1080.0
L_{j=33}	500.0	F_{j=26}	0.0
L_{j=34}	500.0	F_{j=27}	0.0
L_{j=35}	500.0	F_{j=28}	0.0
L_{j=36}	500.0	F_{j=29}	0.0
L_{j=37}	500.0	F_{j=30}	0.0
L_{j=38}	500.0	F_{j=31}	0.0
L_{j=39}	500.0	F_{j=32}	0.0
L_{j=40}	500.0	F_{j=33}	0.0
L_{j=41}	500.0	F_{j=34}	0.0

L_{j=42}	500.0
L_{j=43}	500.0
L_{j=44}	500.0
L_{j=45}	500.0
L_{j=46}	500.0
L_{j=47}	500.0
L_{j=48}	500.0
L_{j=49}	500.0
Q^{c}	2.00E5
T_{j=0}	368.15
T_{j=1}	368.15
T_{j=2}	368.15
T_{j=3}	368.15
T_{j=4}	368.15
T_{j=5}	368.15
T_{j=6}	370.15
T_{j=7}	370.15
T_{j=8}	370.15
T_{j=9}	370.15
T_{j=10}	370.15
T_{j=11}	372.15
T_{j=12}	372.15
T_{j=13}	372.15
T_{j=14}	372.15
T_{j=15}	372.15
T_{j=16}	374.15
T_{j=17}	374.15
T_{j=18}	374.15
T_{j=19}	374.15
T_{j=20}	374.15
T_{j=21}	376.15
T_{j=22}	376.15
T_{j=23}	376.15
T_{j=24}	376.15
T_{j=25}	376.15
T_{j=26}	378.15
T_{j=27}	378.15
T_{j=28}	378.15
T_{j=29}	378.15
T_{j=30}	378.15
T_{j=31}	380.15
T_{j=32}	380.15
T_{j=33}	380.15
T_{j=34}	380.15
T_{j=35}	380.15
T_{j=36}	382.15
T_{j=37}	382.15
T_{j=38}	382.15
T_{j=39}	382.15
T_{j=40}	382.15
T_{j=41}	384.15
T_{j=42}	384.15
T_{j=43}	384.15
T_{j=44}	384.15
T_{j=45}	384.15
T_{j=46}	386.15
T_{j=47}	386.15
T_{j=48}	386.15
T_{j=49}	386.15
V_{j=1}	580.0
V_{j=2}	580.0
V_{j=3}	580.0
V_{j=4}	580.0
V_{j=5}	580.0
V_{j=6}	580.0
V_{j=7}	580.0
V_{j=8}	580.0

F_{j=35}	0.0
F_{j=36}	0.0
F_{j=37}	0.0
F_{j=38}	0.0
F_{j=39}	0.0
F_{j=40}	0.0
F_{j=41}	0.0
F_{j=42}	0.0
F_{j=43}	0.0
F_{j=44}	0.0
F_{j=45}	0.0
F_{j=46}	0.0
F_{j=47}	0.0
F_{j=48}	0.0
P	12
Q^{r}	1.6750992E7
R^{c}	1.20773
T_{i=1}^{b}	353.25
T_{i=1}^{c}	835.25
T_{i=2}^{b}	383.75
T_{i=2}^{c}	864.85
\gamma_{j=1,i=1}	1.0
\gamma_{j=1,i=2}	1.0
\gamma_{j=2,i=1}	1.0
\gamma_{j=2,i=2}	1.0
\gamma_{j=3,i=1}	1.0
\gamma_{j=3,i=2}	1.0
\gamma_{j=4,i=1}	1.0
\gamma_{j=4,i=2}	1.0
\gamma_{j=5,i=1}	1.0
\gamma_{j=5,i=2}	1.0
\gamma_{j=6,i=1}	1.0
\gamma_{j=6,i=2}	1.0
\gamma_{j=7,i=1}	1.0
\gamma_{j=7,i=2}	1.0
\gamma_{j=8,i=1}	1.0
\gamma_{j=8,i=2}	1.0
\gamma_{j=9,i=1}	1.0
\gamma_{j=9,i=2}	1.0
\gamma_{j=10,i=1}	1.0
\gamma_{j=10,i=2}	1.0
\gamma_{j=11,i=1}	1.0
\gamma_{j=11,i=2}	1.0
\gamma_{j=12,i=1}	1.0
\gamma_{j=12,i=2}	1.0
\gamma_{j=13,i=1}	1.0
\gamma_{j=13,i=2}	1.0
\gamma_{j=14,i=1}	1.0
\gamma_{j=14,i=2}	1.0
\gamma_{j=15,i=1}	1.0
\gamma_{j=15,i=2}	1.0
\gamma_{j=16,i=1}	1.0
\gamma_{j=16,i=2}	1.0
\gamma_{j=17,i=1}	1.0
\gamma_{j=17,i=2}	1.0
\gamma_{j=18,i=1}	1.0
\gamma_{j=18,i=2}	1.0
\gamma_{j=19,i=1}	1.0
\gamma_{j=19,i=2}	1.0
\gamma_{j=20,i=1}	1.0
\gamma_{j=20,i=2}	1.0
\gamma_{j=21,i=1}	1.0
\gamma_{j=21,i=2}	1.0
\gamma_{j=22,i=1}	1.0
\gamma_{j=22,i=2}	1.0
\gamma_{j=23,i=1}	1.0
\gamma_{j=23,i=2}	1.0

V_{j=9}	580.0
V_{j=10}	580.0
V_{j=11}	580.0
V_{j=12}	580.0
V_{j=13}	580.0
V_{j=14}	580.0
V_{j=15}	580.0
V_{j=16}	580.0
V_{j=17}	580.0
V_{j=18}	580.0
V_{j=19}	580.0
V_{j=20}	580.0
V_{j=21}	580.0
V_{j=22}	580.0
V_{j=23}	580.0
V_{j=24}	580.0
V_{j=25}	580.0
V_{j=26}	580.0
V_{j=27}	580.0
V_{j=28}	580.0
V_{j=29}	580.0
V_{j=30}	580.0
V_{j=31}	580.0
V_{j=32}	580.0
V_{j=33}	580.0
V_{j=34}	580.0
V_{j=35}	580.0
V_{j=36}	580.0
V_{j=37}	580.0
V_{j=38}	580.0
V_{j=39}	580.0
V_{j=40}	580.0
V_{j=41}	580.0
V_{j=42}	580.0
V_{j=43}	580.0
V_{j=44}	580.0
V_{j=45}	580.0
V_{j=46}	580.0
V_{j=47}	580.0
V_{j=48}	580.0
V_{j=49}	580.0
x_{j=0,i=1}	0.95
x_{j=0,i=2}	0.05
x_{j=1,i=1}	0.95
x_{j=1,i=2}	0.05
x_{j=2,i=1}	0.95
x_{j=2,i=2}	0.05
x_{j=3,i=1}	0.95
x_{j=3,i=2}	0.05
x_{j=4,i=1}	0.95
x_{j=4,i=2}	0.05
x_{j=5,i=1}	0.95
x_{j=5,i=2}	0.05
x_{j=6,i=1}	0.90
x_{j=6,i=2}	0.10
x_{j=7,i=1}	0.90
x_{j=7,i=2}	0.10
x_{j=8,i=1}	0.90
x_{j=8,i=2}	0.10
x_{j=9,i=1}	0.90
x_{j=9,i=2}	0.10
x_{j=10,i=1}	0.90
x_{j=10,i=2}	0.10
x_{j=11,i=1}	0.85
x_{j=11,i=2}	0.15
x_{j=12,i=1}	0.85
x_{j=12,i=2}	0.15
\gamma_{j=24,i=1}	1.0
\gamma_{j=24,i=2}	1.0
\gamma_{j=25,i=1}	1.0
\gamma_{j=25,i=2}	1.0
\gamma_{j=26,i=1}	1.0
\gamma_{j=26,i=2}	1.0
\gamma_{j=27,i=1}	1.0
\gamma_{j=27,i=2}	1.0
\gamma_{j=28,i=1}	1.0
\gamma_{j=28,i=2}	1.0
\gamma_{j=29,i=1}	1.0
\gamma_{j=29,i=2}	1.0
\gamma_{j=30,i=1}	1.0
\gamma_{j=30,i=2}	1.0
\gamma_{j=31,i=1}	1.0
\gamma_{j=31,i=2}	1.0
\gamma_{j=32,i=1}	1.0
\gamma_{j=32,i=2}	1.0
\gamma_{j=33,i=1}	1.0
\gamma_{j=33,i=2}	1.0
\gamma_{j=34,i=1}	1.0
\gamma_{j=34,i=2}	1.0
\gamma_{j=35,i=1}	1.0
\gamma_{j=35,i=2}	1.0
\gamma_{j=36,i=1}	1.0
\gamma_{j=36,i=2}	1.0
\gamma_{j=37,i=1}	1.0
\gamma_{j=37,i=2}	1.0
\gamma_{j=38,i=1}	1.0
\gamma_{j=38,i=2}	1.0
\gamma_{j=39,i=1}	1.0
\gamma_{j=39,i=2}	1.0
\gamma_{j=40,i=1}	1.0
\gamma_{j=40,i=2}	1.0
\gamma_{j=41,i=1}	1.0
\gamma_{j=41,i=2}	1.0
\gamma_{j=42,i=1}	1.0
\gamma_{j=42,i=2}	1.0
\gamma_{j=43,i=1}	1.0
\gamma_{j=43,i=2}	1.0
\gamma_{j=44,i=1}	1.0
\gamma_{j=44,i=2}	1.0
\gamma_{j=45,i=1}	1.0
\gamma_{j=45,i=2}	1.0
\gamma_{j=46,i=1}	1.0
\gamma_{j=46,i=2}	1.0
\gamma_{j=47,i=1}	1.0
\gamma_{j=47,i=2}	1.0
\gamma_{j=48,i=1}	1.0
\gamma_{j=48,i=2}	1.0
\gamma_{j=49,i=1}	1.0
\gamma_{j=49,i=2}	1.0
\lambda_{i=1}^{b}	30781.0
\lambda_{i=2}^{b}	33201.0
\phi	1.0
z_{i=1}	0.33
z_{i=2}	0.67

x_{j=13,i=1}	0.85
x_{j=13,i=2}	0.15
x_{j=14,i=1}	0.85
x_{j=14,i=2}	0.15
x_{j=15,i=1}	0.85
x_{j=15,i=2}	0.15
x_{j=16,i=1}	0.80
x_{j=16,i=2}	0.20
x_{j=17,i=1}	0.80
x_{j=17,i=2}	0.20
x_{j=18,i=1}	0.80
x_{j=18,i=2}	0.20
x_{j=19,i=1}	0.80
x_{j=19,i=2}	0.20
x_{j=20,i=1}	0.80
x_{j=20,i=2}	0.20
x_{j=21,i=1}	0.75
x_{j=21,i=2}	0.25
x_{j=22,i=1}	0.75
x_{j=22,i=2}	0.25
x_{j=23,i=1}	0.75
x_{j=23,i=2}	0.25
x_{j=24,i=1}	0.75
x_{j=24,i=2}	0.25
x_{j=25,i=1}	0.75
x_{j=25,i=2}	0.25
x_{j=26,i=1}	0.70
x_{j=26,i=2}	0.30
x_{j=27,i=1}	0.70
x_{j=27,i=2}	0.30
x_{j=28,i=1}	0.70
x_{j=28,i=2}	0.30
x_{j=29,i=1}	0.70
x_{j=29,i=2}	0.30
x_{j=30,i=1}	0.70
x_{j=30,i=2}	0.30
x_{j=31,i=1}	0.65
x_{j=31,i=2}	0.35
x_{j=32,i=1}	0.65
x_{j=32,i=2}	0.35
x_{j=33,i=1}	0.65
x_{j=33,i=2}	0.35
x_{j=34,i=1}	0.65
x_{j=34,i=2}	0.35
x_{j=35,i=1}	0.65
x_{j=35,i=2}	0.35
x_{j=36,i=1}	0.60
x_{j=36,i=2}	0.40
x_{j=37,i=1}	0.60
x_{j=37,i=2}	0.40
x_{j=38,i=1}	0.60
x_{j=38,i=2}	0.40
x_{j=39,i=1}	0.60
x_{j=39,i=2}	0.40
x_{j=40,i=1}	0.60
x_{j=40,i=2}	0.40
x_{j=41,i=1}	0.55
x_{j=41,i=2}	0.45
x_{j=42,i=1}	0.55
x_{j=42,i=2}	0.45
x_{j=43,i=1}	0.55
x_{j=43,i=2}	0.45
x_{j=44,i=1}	0.55
x_{j=44,i=2}	0.45
x_{j=45,i=1}	0.55
x_{j=45,i=2}	0.45
x_{j=46,i=1}	0.50

x_{j=46,i=2}	0.50
x_{j=47,i=1}	0.50
x_{j=47,i=2}	0.50
x_{j=48,i=1}	0.50
x_{j=48,i=2}	0.50
x_{j=49,i=1}	0.50
x_{j=49,i=2}	0.50
h^{F}	15000.0
h^{V}	34000.0
y_{j=1,i=1}	0.05
y_{j=1,i=2}	0.95
y_{j=2,i=1}	0.05
y_{j=2,i=2}	0.95
y_{j=3,i=1}	0.05
y_{j=3,i=2}	0.95
y_{j=4,i=1}	0.05
y_{j=4,i=2}	0.95
y_{j=5,i=1}	0.05
y_{j=5,i=2}	0.95
y_{j=6,i=1}	0.10
y_{j=6,i=2}	0.90
y_{j=7,i=1}	0.10
y_{j=7,i=2}	0.90
y_{j=8,i=1}	0.10
y_{j=8,i=2}	0.90
y_{j=9,i=1}	0.10
y_{j=9,i=2}	0.90
y_{j=10,i=1}	0.10
y_{j=10,i=2}	0.90
y_{j=11,i=1}	0.15
y_{j=11,i=2}	0.85
y_{j=12,i=1}	0.15
y_{j=12,i=2}	0.85
y_{j=13,i=1}	0.15
y_{j=13,i=2}	0.85
y_{j=14,i=1}	0.15
y_{j=14,i=2}	0.85
y_{j=15,i=1}	0.15
y_{j=15,i=2}	0.85
y_{j=16,i=1}	0.20
y_{j=16,i=2}	0.80
y_{j=17,i=1}	0.20
y_{j=17,i=2}	0.80
y_{j=18,i=1}	0.20
y_{j=18,i=2}	0.80
y_{j=19,i=1}	0.20
y_{j=19,i=2}	0.80
y_{j=20,i=1}	0.20
y_{j=20,i=2}	0.80
y_{j=21,i=1}	0.25
y_{j=21,i=2}	0.75
y_{j=22,i=1}	0.25
y_{j=22,i=2}	0.75
y_{j=23,i=1}	0.25
y_{j=23,i=2}	0.75
y_{j=24,i=1}	0.25
y_{j=24,i=2}	0.75
y_{j=25,i=1}	0.25
y_{j=25,i=2}	0.75
y_{j=26,i=1}	0.30
y_{j=26,i=2}	0.70
y_{j=27,i=1}	0.30
y_{j=27,i=2}	0.70
y_{j=28,i=1}	0.30
y_{j=28,i=2}	0.70
y_{j=29,i=1}	0.30
y_{j=29,i=2}	0.70

y_{j=30,i=1}	0.30
y_{j=30,i=2}	0.70
y_{j=31,i=1}	0.35
y_{j=31,i=2}	0.65
y_{j=32,i=1}	0.35
y_{j=32,i=2}	0.65
y_{j=33,i=1}	0.35
y_{j=33,i=2}	0.65
y_{j=34,i=1}	0.35
y_{j=34,i=2}	0.65
y_{j=35,i=1}	0.35
y_{j=35,i=2}	0.65
y_{j=36,i=1}	0.40
y_{j=36,i=2}	0.60
y_{j=37,i=1}	0.40
y_{j=37,i=2}	0.60
y_{j=38,i=1}	0.40
y_{j=38,i=2}	0.60
y_{j=39,i=1}	0.40
y_{j=39,i=2}	0.60
y_{j=40,i=1}	0.40
y_{j=40,i=2}	0.60
y_{j=41,i=1}	0.45
y_{j=41,i=2}	0.55
y_{j=42,i=1}	0.45
y_{j=42,i=2}	0.55
y_{j=43,i=1}	0.45
y_{j=43,i=2}	0.55
y_{j=44,i=1}	0.45
y_{j=44,i=2}	0.55
y_{j=45,i=1}	0.45
y_{j=45,i=2}	0.55
y_{j=46,i=1}	0.50
y_{j=46,i=2}	0.50
y_{j=47,i=1}	0.50
y_{j=47,i=2}	0.50
y_{j=48,i=1}	0.50
y_{j=48,i=2}	0.50
y_{j=49,i=1}	0.50
y_{j=49,i=2}	0.50
y_{j=50,i=1}	0.50
y_{j=50,i=2}	0.50

A. Generated MATLAB code

```
%*********************************************************
% The namespaces have been normalized. The following
% table shows the attribuation.
% Normalized Name --> Original Name
% ================================
% e0 --> e[0]49963
%*********************************************************

%*********************************************************
% The variables are named according to the notation
% provided in the Mosaic model.
%
% The variable names can be read as follows:
% ==========================================
%   e0_greek_gamma_j#_i#
%       &gamma;: Activity coefficient (0 or 1)
%       Indices
%           j: Stage number
%           i: Component number (1=BZ, 2=Tol)
%
%   e0_greek_phi
%       &phi;: Fugacity coefficient
%
%   e0_A_i#
%       A: Antoine constant
%       Indices
%           i: Component number (1=BZ, 2=Tol)
%
%   e0_A_L_i#
%       A: Antoine constant
%       Superscripts
%           L: Liquid
%       Indices
%           i: Component number (1=BZ, 2=Tol)
%
%   e0_B_r
%       B: Antoine constant
%       Superscripts
%           r: Reboiler
%
%   e0_B_i#
%       B: Antoine constant
%       Indices
%           i: Component number (1=BZ, 2=Tol)
%
%   e0_B_L_i#
%       B: Antoine constant
%       Superscripts
%           L: Liquid
%       Indices
%           i: Component number (1=BZ, 2=Tol)
%
%   e0_C_i#
%       C: Antoine constant
%       Indices
%           i: Component number (1=BZ, 2=Tol)
%
%   e0_C_L_i#
%       C: Antoine constant
%       Superscripts
%           L: Liquid
%       Indices
%           i: Component number (1=BZ, 2=Tol)
%
%   e0_D_c
%       D: Distillate
%       Superscripts
%           c: Condenser/Critical temperature
%
%   e0_F_j##
%       F: Feed molar flow rate
%       Indices
%           j: Stage number
%
%   e0_L_j#
%       L: Liquid molar flow rate
%       Indices
%           j: Stage number
%
%   e0_P
%       P: Total pressure/Saturated vapour pressure
%
%   e0_Q_c
%       Q: Heat duty
%       Superscripts
%           c: Condenser/Critical temperature
%
%   e0_Q_r
%       Q: Heat duty
%       Superscripts
%           r: Reboiler
%
%   e0_R_c
%       R: Reflux ratio
%       Superscripts
%           c: Condenser/Critical temperature
%
%   e0_T_b_i#
%       T: Temperature
%       Superscripts
```

```
%           b: Normal latent heat of vaporization/boiling point
%       Indices
%           i: Component number (1=BZ, 2=Tol)
%
%   e0_T_c_i#
%       T: Temperature
%       Superscripts
%           c: Condenser/Critical temperature
%       Indices
%           i: Component number (1=BZ, 2=Tol)
%
%   e0_T_j#
%       T: Temperature
%       Indices
%           j: Stage number
%
%   e0_V_j##
%       V: Vapour molar flow rate
%       Indices
%           j: Stage number
%
%   e0_h_F
%       h: Enthalpy
%       Superscripts
%           F: Feed
%
%   e0_h_V_j##
%       h: Enthalpy
%       Superscripts
%           V: Vapour
%       Indices
%           j: Stage number
%
%   e0_x_j#_i#
%       x: Liquid mole fraction
%       Indices
%           j: Stage number
%           i: Component number (1=BZ, 2=Tol)
%
%   e0_y_j#_i#
%       y: Vapour mole fraction
%       Indices
%           j: Stage number
%           i: Component number (1=BZ, 2=Tol)
%
%   e0_z_i#
%       z: Feed composition
%       Indices
%           i: Component number (1=BZ, 2=Tol)
%
%   e0_greek_lambda_b_i#
%       &lambda;: Latent heat of vaporization
%       Superscripts
%           b: Normal latent heat of vaporization/boiling point
%       Indices
%           i: Component number (1=BZ, 2=Tol)
%
%*************************************************************

function[ROOTS]=solveEquationSystem()

    % load variable init values
    X_ITER(1) = 200.0;      % e0_B_r
    X_ITER(2) = 100.0;      % e0_D_c
    X_ITER(3) = 500.0;      % e0_L_j0
    X_ITER(4) = 500.0;      % e0_L_j10
    X_ITER(5) = 500.0;      % e0_L_j11
    X_ITER(6) = 500.0;      % e0_L_j12
    X_ITER(7) = 500.0;      % e0_L_j13
    X_ITER(8) = 500.0;      % e0_L_j14
    X_ITER(9) = 500.0;      % e0_L_j15
    X_ITER(10) = 500.0;     % e0_L_j16
    X_ITER(11) = 500.0;     % e0_L_j17
    X_ITER(12) = 500.0;     % e0_L_j18
    X_ITER(13) = 500.0;     % e0_L_j19
    X_ITER(14) = 500.0;     % e0_L_j1
    X_ITER(15) = 500.0;     % e0_L_j20
    X_ITER(16) = 500.0;     % e0_L_j21
    X_ITER(17) = 500.0;     % e0_L_j22
    X_ITER(18) = 500.0;     % e0_L_j23
    X_ITER(19) = 500.0;     % e0_L_j24
    X_ITER(20) = 500.0;     % e0_L_j25
    X_ITER(21) = 500.0;     % e0_L_j26
    X_ITER(22) = 500.0;     % e0_L_j27
    X_ITER(23) = 500.0;     % e0_L_j28
    X_ITER(24) = 500.0;     % e0_L_j29
    X_ITER(25) = 500.0;     % e0_L_j2
    X_ITER(26) = 500.0;     % e0_L_j30
    X_ITER(27) = 500.0;     % e0_L_j31
    X_ITER(28) = 500.0;     % e0_L_j32
    X_ITER(29) = 500.0;     % e0_L_j33
    X_ITER(30) = 500.0;     % e0_L_j34
    X_ITER(31) = 500.0;     % e0_L_j35
    X_ITER(32) = 500.0;     % e0_L_j36
    X_ITER(33) = 500.0;     % e0_L_j37
    X_ITER(34) = 500.0;     % e0_L_j38
    X_ITER(35) = 500.0;     % e0_L_j39
    X_ITER(36) = 500.0;     % e0_L_j3
    X_ITER(37) = 500.0;     % e0_L_j40
    X_ITER(38) = 500.0;     % e0_L_j41
    X_ITER(39) = 500.0;     % e0_L_j42
    X_ITER(40) = 500.0;     % e0_L_j43
    X_ITER(41) = 500.0;     % e0_L_j44
```

```
X_ITER(42) = 500.0;     % e0_L_j45
X_ITER(43) = 500.0;     % e0_L_j46
X_ITER(44) = 500.0;     % e0_L_j47
X_ITER(45) = 500.0;     % e0_L_j48
X_ITER(46) = 500.0;     % e0_L_j49
X_ITER(47) = 500.0;     % e0_L_j4
X_ITER(48) = 500.0;     % e0_L_j5
X_ITER(49) = 500.0;     % e0_L_j6
X_ITER(50) = 500.0;     % e0_L_j7
X_ITER(51) = 500.0;     % e0_L_j8
X_ITER(52) = 500.0;     % e0_L_j9
X_ITER(53) = 200000.0;      % e0_Q_c
X_ITER(54) = 368.15;    % e0_T_j0
X_ITER(55) = 370.15;    % e0_T_j10
X_ITER(56) = 372.15;    % e0_T_j11
X_ITER(57) = 372.15;    % e0_T_j12
X_ITER(58) = 372.15;    % e0_T_j13
X_ITER(59) = 372.15;    % e0_T_j14
X_ITER(60) = 372.15;    % e0_T_j15
X_ITER(61) = 374.15;    % e0_T_j16
X_ITER(62) = 374.15;    % e0_T_j17
X_ITER(63) = 374.15;    % e0_T_j18
X_ITER(64) = 374.15;    % e0_T_j19
X_ITER(65) = 368.15;    % e0_T_j1
X_ITER(66) = 374.15;    % e0_T_j20
X_ITER(67) = 376.15;    % e0_T_j21
X_ITER(68) = 376.15;    % e0_T_j22
X_ITER(69) = 376.15;    % e0_T_j23
X_ITER(70) = 376.15;    % e0_T_j24
X_ITER(71) = 376.15;    % e0_T_j25
X_ITER(72) = 378.15;    % e0_T_j26
X_ITER(73) = 378.15;    % e0_T_j27
X_ITER(74) = 378.15;    % e0_T_j28
X_ITER(75) = 378.15;    % e0_T_j29
X_ITER(76) = 368.15;    % e0_T_j2
X_ITER(77) = 378.15;    % e0_T_j30
X_ITER(78) = 380.15;    % e0_T_j31
X_ITER(79) = 380.15;    % e0_T_j32
X_ITER(80) = 380.15;    % e0_T_j33
X_ITER(81) = 380.15;    % e0_T_j34
X_ITER(82) = 380.15;    % e0_T_j35
X_ITER(83) = 382.15;    % e0_T_j36
X_ITER(84) = 382.15;    % e0_T_j37
X_ITER(85) = 382.15;    % e0_T_j38
X_ITER(86) = 382.15;    % e0_T_j39
X_ITER(87) = 368.15;    % e0_T_j3
X_ITER(88) = 382.15;    % e0_T_j40
X_ITER(89) = 384.15;    % e0_T_j41
X_ITER(90) = 384.15;    % e0_T_j42
X_ITER(91) = 384.15;    % e0_T_j43
X_ITER(92) = 384.15;    % e0_T_j44
X_ITER(93) = 384.15;    % e0_T_j45
X_ITER(94) = 386.15;    % e0_T_j46
X_ITER(95) = 386.15;    % e0_T_j47
X_ITER(96) = 386.15;    % e0_T_j48
X_ITER(97) = 386.15;    % e0_T_j49
X_ITER(98) = 368.15;    % e0_T_j4
X_ITER(99) = 368.15;    % e0_T_j5
X_ITER(100) = 370.15;   % e0_T_j6
X_ITER(101) = 370.15;   % e0_T_j7
X_ITER(102) = 370.15;   % e0_T_j8
X_ITER(103) = 370.15;   % e0_T_j9
X_ITER(104) = 580.0;    % e0_V_j10
X_ITER(105) = 580.0;    % e0_V_j11
X_ITER(106) = 580.0;    % e0_V_j12
X_ITER(107) = 580.0;    % e0_V_j13
X_ITER(108) = 580.0;    % e0_V_j14
X_ITER(109) = 580.0;    % e0_V_j15
X_ITER(110) = 580.0;    % e0_V_j16
X_ITER(111) = 580.0;    % e0_V_j17
X_ITER(112) = 580.0;    % e0_V_j18
X_ITER(113) = 580.0;    % e0_V_j19
X_ITER(114) = 580.0;    % e0_V_j1
X_ITER(115) = 580.0;    % e0_V_j20
X_ITER(116) = 580.0;    % e0_V_j21
X_ITER(117) = 580.0;    % e0_V_j22
X_ITER(118) = 580.0;    % e0_V_j23
X_ITER(119) = 580.0;    % e0_V_j24
X_ITER(120) = 580.0;    % e0_V_j25
X_ITER(121) = 580.0;    % e0_V_j26
X_ITER(122) = 580.0;    % e0_V_j27
X_ITER(123) = 580.0;    % e0_V_j28
X_ITER(124) = 580.0;    % e0_V_j29
X_ITER(125) = 580.0;    % e0_V_j2
X_ITER(126) = 580.0;    % e0_V_j30
X_ITER(127) = 580.0;    % e0_V_j31
X_ITER(128) = 580.0;    % e0_V_j32
X_ITER(129) = 580.0;    % e0_V_j33
X_ITER(130) = 580.0;    % e0_V_j34
X_ITER(131) = 580.0;    % e0_V_j35
X_ITER(132) = 580.0;    % e0_V_j36
X_ITER(133) = 580.0;    % e0_V_j37
X_ITER(134) = 580.0;    % e0_V_j38
X_ITER(135) = 580.0;    % e0_V_j39
X_ITER(136) = 580.0;    % e0_V_j3
X_ITER(137) = 580.0;    % e0_V_j40
X_ITER(138) = 580.0;    % e0_V_j41
X_ITER(139) = 580.0;    % e0_V_j42
X_ITER(140) = 580.0;    % e0_V_j43
X_ITER(141) = 580.0;    % e0_V_j44
X_ITER(142) = 580.0;    % e0_V_j45
X_ITER(143) = 580.0;    % e0_V_j46
X_ITER(144) = 580.0;    % e0_V_j47
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X_ITER(145) = 580.0;     % e0_V_j48
X_ITER(146) = 580.0;     % e0_V_j49
X_ITER(147) = 580.0;     % e0_V_j4
X_ITER(148) = 580.0;     % e0_V_j50
X_ITER(149) = 580.0;     % e0_V_j5
X_ITER(150) = 580.0;     % e0_V_j6
X_ITER(151) = 580.0;     % e0_V_j7
X_ITER(152) = 580.0;     % e0_V_j8
X_ITER(153) = 580.0;     % e0_V_j9
X_ITER(154) = 15000.0;       % e0_h_F
X_ITER(155) = 34000.0;       % e0_h_V_j50
X_ITER(156) = 0.95;      % e0_x_j0_i1
X_ITER(157) = 0.05;      % e0_x_j0_i2
X_ITER(158) = 0.95;      % e0_x_j1_i1
X_ITER(159) = 0.05;      % e0_x_j1_i2
X_ITER(160) = 0.9;       % e0_x_j10_i1
X_ITER(161) = 0.1;       % e0_x_j10_i2
X_ITER(162) = 0.85;      % e0_x_j11_i1
X_ITER(163) = 0.15;      % e0_x_j11_i2
X_ITER(164) = 0.85;      % e0_x_j12_i1
X_ITER(165) = 0.15;      % e0_x_j12_i2
X_ITER(166) = 0.85;      % e0_x_j13_i1
X_ITER(167) = 0.15;      % e0_x_j13_i2
X_ITER(168) = 0.85;      % e0_x_j14_i1
X_ITER(169) = 0.15;      % e0_x_j14_i2
X_ITER(170) = 0.85;      % e0_x_j15_i1
X_ITER(171) = 0.15;      % e0_x_j15_i2
X_ITER(172) = 0.8;       % e0_x_j16_i1
X_ITER(173) = 0.2;       % e0_x_j16_i2
X_ITER(174) = 0.8;       % e0_x_j17_i1
X_ITER(175) = 0.2;       % e0_x_j17_i2
X_ITER(176) = 0.8;       % e0_x_j18_i1
X_ITER(177) = 0.2;       % e0_x_j18_i2
X_ITER(178) = 0.8;       % e0_x_j19_i1
X_ITER(179) = 0.2;       % e0_x_j19_i2
X_ITER(180) = 0.95;      % e0_x_j2_i1
X_ITER(181) = 0.05;      % e0_x_j2_i2
X_ITER(182) = 0.8;       % e0_x_j20_i1
X_ITER(183) = 0.2;       % e0_x_j20_i2
X_ITER(184) = 0.75;      % e0_x_j21_i1
X_ITER(185) = 0.25;      % e0_x_j21_i2
X_ITER(186) = 0.75;      % e0_x_j22_i1
X_ITER(187) = 0.25;      % e0_x_j22_i2
X_ITER(188) = 0.75;      % e0_x_j23_i1
X_ITER(189) = 0.25;      % e0_x_j23_i2
X_ITER(190) = 0.75;      % e0_x_j24_i1
X_ITER(191) = 0.25;      % e0_x_j24_i2
X_ITER(192) = 0.75;      % e0_x_j25_i1
X_ITER(193) = 0.25;      % e0_x_j25_i2
X_ITER(194) = 0.7;       % e0_x_j26_i1
X_ITER(195) = 0.3;       % e0_x_j26_i2
X_ITER(196) = 0.7;       % e0_x_j27_i1
X_ITER(197) = 0.3;       % e0_x_j27_i2
X_ITER(198) = 0.7;       % e0_x_j28_i1
X_ITER(199) = 0.3;       % e0_x_j28_i2
X_ITER(200) = 0.7;       % e0_x_j29_i1
X_ITER(201) = 0.3;       % e0_x_j29_i2
X_ITER(202) = 0.95;      % e0_x_j3_i1
X_ITER(203) = 0.05;      % e0_x_j3_i2
X_ITER(204) = 0.7;       % e0_x_j30_i1
X_ITER(205) = 0.3;       % e0_x_j30_i2
X_ITER(206) = 0.65;      % e0_x_j31_i1
X_ITER(207) = 0.35;      % e0_x_j31_i2
X_ITER(208) = 0.65;      % e0_x_j32_i1
X_ITER(209) = 0.35;      % e0_x_j32_i2
X_ITER(210) = 0.65;      % e0_x_j33_i1
X_ITER(211) = 0.35;      % e0_x_j33_i2
X_ITER(212) = 0.65;      % e0_x_j34_i1
X_ITER(213) = 0.35;      % e0_x_j34_i2
X_ITER(214) = 0.65;      % e0_x_j35_i1
X_ITER(215) = 0.35;      % e0_x_j35_i2
X_ITER(216) = 0.6;       % e0_x_j36_i1
X_ITER(217) = 0.4;       % e0_x_j36_i2
X_ITER(218) = 0.6;       % e0_x_j37_i1
X_ITER(219) = 0.4;       % e0_x_j37_i2
X_ITER(220) = 0.6;       % e0_x_j38_i1
X_ITER(221) = 0.4;       % e0_x_j38_i2
X_ITER(222) = 0.6;       % e0_x_j39_i1
X_ITER(223) = 0.4;       % e0_x_j39_i2
X_ITER(224) = 0.95;      % e0_x_j4_i1
X_ITER(225) = 0.05;      % e0_x_j4_i2
X_ITER(226) = 0.6;       % e0_x_j40_i1
X_ITER(227) = 0.4;       % e0_x_j40_i2
X_ITER(228) = 0.55;      % e0_x_j41_i1
X_ITER(229) = 0.45;      % e0_x_j41_i2
X_ITER(230) = 0.55;      % e0_x_j42_i1
X_ITER(231) = 0.45;      % e0_x_j42_i2
X_ITER(232) = 0.55;      % e0_x_j43_i1
X_ITER(233) = 0.45;      % e0_x_j43_i2
X_ITER(234) = 0.55;      % e0_x_j44_i1
X_ITER(235) = 0.45;      % e0_x_j44_i2
X_ITER(236) = 0.55;      % e0_x_j45_i1
X_ITER(237) = 0.45;      % e0_x_j45_i2
X_ITER(238) = 0.5;       % e0_x_j46_i1
X_ITER(239) = 0.5;       % e0_x_j46_i2
X_ITER(240) = 0.5;       % e0_x_j47_i1
X_ITER(241) = 0.5;       % e0_x_j47_i2
X_ITER(242) = 0.5;       % e0_x_j48_i1
X_ITER(243) = 0.5;       % e0_x_j48_i2
X_ITER(244) = 0.5;       % e0_x_j49_i1
X_ITER(245) = 0.5;       % e0_x_j49_i2
X_ITER(246) = 0.95;      % e0_x_j5_i1
X_ITER(247) = 0.05;      % e0_x_j5_i2
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X_ITER(248) = 0.9;      % e0_x_j6_i1
X_ITER(249) = 0.1;      % e0_x_j6_i2
X_ITER(250) = 0.9;      % e0_x_j7_i1
X_ITER(251) = 0.1;      % e0_x_j7_i2
X_ITER(252) = 0.9;      % e0_x_j8_i1
X_ITER(253) = 0.1;      % e0_x_j8_i2
X_ITER(254) = 0.9;      % e0_x_j9_i1
X_ITER(255) = 0.1;      % e0_x_j9_i2
X_ITER(256) = 0.05;     % e0_y_j1_i1
X_ITER(257) = 0.95;     % e0_y_j1_i2
X_ITER(258) = 0.1;      % e0_y_j10_i1
X_ITER(259) = 0.9;      % e0_y_j10_i2
X_ITER(260) = 0.15;     % e0_y_j11_i1
X_ITER(261) = 0.85;     % e0_y_j11_i2
X_ITER(262) = 0.15;     % e0_y_j12_i1
X_ITER(263) = 0.85;     % e0_y_j12_i2
X_ITER(264) = 0.15;     % e0_y_j13_i1
X_ITER(265) = 0.85;     % e0_y_j13_i2
X_ITER(266) = 0.15;     % e0_y_j14_i1
X_ITER(267) = 0.85;     % e0_y_j14_i2
X_ITER(268) = 0.15;     % e0_y_j15_i1
X_ITER(269) = 0.85;     % e0_y_j15_i2
X_ITER(270) = 0.2;      % e0_y_j16_i1
X_ITER(271) = 0.8;      % e0_y_j16_i2
X_ITER(272) = 0.2;      % e0_y_j17_i1
X_ITER(273) = 0.8;      % e0_y_j17_i2
X_ITER(274) = 0.2;      % e0_y_j18_i1
X_ITER(275) = 0.8;      % e0_y_j18_i2
X_ITER(276) = 0.2;      % e0_y_j19_i1
X_ITER(277) = 0.8;      % e0_y_j19_i2
X_ITER(278) = 0.05;     % e0_y_j2_i1
X_ITER(279) = 0.95;     % e0_y_j2_i2
X_ITER(280) = 0.2;      % e0_y_j20_i1
X_ITER(281) = 0.8;      % e0_y_j20_i2
X_ITER(282) = 0.25;     % e0_y_j21_i1
X_ITER(283) = 0.75;     % e0_y_j21_i2
X_ITER(284) = 0.25;     % e0_y_j22_i1
X_ITER(285) = 0.75;     % e0_y_j22_i2
X_ITER(286) = 0.25;     % e0_y_j23_i1
X_ITER(287) = 0.75;     % e0_y_j23_i2
X_ITER(288) = 0.25;     % e0_y_j24_i1
X_ITER(289) = 0.75;     % e0_y_j24_i2
X_ITER(290) = 0.25;     % e0_y_j25_i1
X_ITER(291) = 0.75;     % e0_y_j25_i2
X_ITER(292) = 0.3;      % e0_y_j26_i1
X_ITER(293) = 0.7;      % e0_y_j26_i2
X_ITER(294) = 0.3;      % e0_y_j27_i1
X_ITER(295) = 0.7;      % e0_y_j27_i2
X_ITER(296) = 0.3;      % e0_y_j28_i1
X_ITER(297) = 0.7;      % e0_y_j28_i2
X_ITER(298) = 0.3;      % e0_y_j29_i1
X_ITER(299) = 0.7;      % e0_y_j29_i2
X_ITER(300) = 0.05;     % e0_y_j3_i1
X_ITER(301) = 0.95;     % e0_y_j3_i2
X_ITER(302) = 0.3;      % e0_y_j30_i1
X_ITER(303) = 0.7;      % e0_y_j30_i2
X_ITER(304) = 0.35;     % e0_y_j31_i1
X_ITER(305) = 0.65;     % e0_y_j31_i2
X_ITER(306) = 0.35;     % e0_y_j32_i1
X_ITER(307) = 0.65;     % e0_y_j32_i2
X_ITER(308) = 0.35;     % e0_y_j33_i1
X_ITER(309) = 0.65;     % e0_y_j33_i2
X_ITER(310) = 0.35;     % e0_y_j34_i1
X_ITER(311) = 0.65;     % e0_y_j34_i2
X_ITER(312) = 0.35;     % e0_y_j35_i1
X_ITER(313) = 0.65;     % e0_y_j35_i2
X_ITER(314) = 0.4;      % e0_y_j36_i1
X_ITER(315) = 0.6;      % e0_y_j36_i2
X_ITER(316) = 0.4;      % e0_y_j37_i1
X_ITER(317) = 0.6;      % e0_y_j37_i2
X_ITER(318) = 0.4;      % e0_y_j38_i1
X_ITER(319) = 0.6;      % e0_y_j38_i2
X_ITER(320) = 0.4;      % e0_y_j39_i1
X_ITER(321) = 0.6;      % e0_y_j39_i2
X_ITER(322) = 0.05;     % e0_y_j4_i1
X_ITER(323) = 0.95;     % e0_y_j4_i2
X_ITER(324) = 0.4;      % e0_y_j40_i1
X_ITER(325) = 0.6;      % e0_y_j40_i2
X_ITER(326) = 0.45;     % e0_y_j41_i1
X_ITER(327) = 0.55;     % e0_y_j41_i2
X_ITER(328) = 0.45;     % e0_y_j42_i1
X_ITER(329) = 0.55;     % e0_y_j42_i2
X_ITER(330) = 0.45;     % e0_y_j43_i1
X_ITER(331) = 0.55;     % e0_y_j43_i2
X_ITER(332) = 0.45;     % e0_y_j44_i1
X_ITER(333) = 0.55;     % e0_y_j44_i2
X_ITER(334) = 0.45;     % e0_y_j45_i1
X_ITER(335) = 0.55;     % e0_y_j45_i2
X_ITER(336) = 0.5;      % e0_y_j46_i1
X_ITER(337) = 0.5;      % e0_y_j46_i2
X_ITER(338) = 0.5;      % e0_y_j47_i1
X_ITER(339) = 0.5;      % e0_y_j47_i2
X_ITER(340) = 0.5;      % e0_y_j48_i1
X_ITER(341) = 0.5;      % e0_y_j48_i2
X_ITER(342) = 0.5;      % e0_y_j49_i1
X_ITER(343) = 0.5;      % e0_y_j49_i2
X_ITER(344) = 0.05;     % e0_y_j5_i1
X_ITER(345) = 0.95;     % e0_y_j5_i2
X_ITER(346) = 0.5;      % e0_y_j50_i1
X_ITER(347) = 0.0;      % e0_y_j50_i2
X_ITER(348) = 0.1;      % e0_y_j6_i1
X_ITER(349) = 0.9;      % e0_y_j6_i2
X_ITER(350) = 0.1;      % e0_y_j7_i1
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X_ITER(351) = 0.9;      % e0_y_j7_i2
X_ITER(352) = 0.1;      % e0_y_j8_i1
X_ITER(353) = 0.9;      % e0_y_j8_i2
X_ITER(354) = 0.1;      % e0_y_j9_i1
X_ITER(355) = 0.9;      % e0_y_j9_i2

% load parameters
PARAMS(1) = 16.0137;    % e0_A_i2
PARAMS(2) = -6.2106;    % e0_A_L_i1
PARAMS(3) = 125.8;      % e0_A_L_i2
PARAMS(4) = 383.75;     % e0_T_b_i2
PARAMS(5) = 15.9008;    % e0_A_i1
PARAMS(6) = 1.0;    % e0_greek_phi
PARAMS(7) = 864.85;     % e0_T_c_i2
PARAMS(8) = 1.0;    % e0_greek_gamma_j25_i2
PARAMS(9) = 1.0;    % e0_greek_gamma_j25_i1
PARAMS(10) = 1.0;   % e0_greek_gamma_j26_i2
PARAMS(11) = 1.0;   % e0_greek_gamma_j26_i1
PARAMS(12) = 1.0;   % e0_greek_gamma_j27_i2
PARAMS(13) = 0.565;     % e0_B_L_i1
PARAMS(14) = 1.0;   % e0_greek_gamma_j27_i1
PARAMS(15) = 2788.51;   % e0_B_i1
PARAMS(16) = 0.0565;    % e0_B_L_i2
PARAMS(17) = 3096.52;   % e0_B_i2
PARAMS(18) = 1.0;   % e0_greek_gamma_j23_i2
PARAMS(19) = 1.0;   % e0_greek_gamma_j23_i1
PARAMS(20) = 1.0;   % e0_greek_gamma_j24_i2
PARAMS(21) = 1.0;   % e0_greek_gamma_j24_i1
PARAMS(22) = 1.3593E-4;     % e0_C_L_i2
PARAMS(23) = 0.0;   % e0_F_j11
PARAMS(24) = 0.0;   % e0_F_j10
PARAMS(25) = -52.36;    % e0_C_i1
PARAMS(26) = -53.67;    % e0_C_i2
PARAMS(27) = -3.141E-4;     % e0_C_L_i1
PARAMS(28) = 1.0;   % e0_greek_gamma_j20_i1
PARAMS(29) = 1.0;   % e0_greek_gamma_j2_i2
PARAMS(30) = 1.0;   % e0_greek_gamma_j21_i1
PARAMS(31) = 1.0;   % e0_greek_gamma_j20_i2
PARAMS(32) = 1.0;   % e0_greek_gamma_j22_i1
PARAMS(33) = 0.0;   % e0_F_j13
PARAMS(34) = 1.0;   % e0_greek_gamma_j21_i2
PARAMS(35) = 0.0;   % e0_F_j12
PARAMS(36) = 1.0;   % e0_greek_gamma_j22_i2
PARAMS(37) = 0.0;   % e0_F_j14
PARAMS(38) = 1.0;   % e0_greek_gamma_j19_i1
PARAMS(39) = 1.0;   % e0_greek_gamma_j2_i1
PARAMS(40) = 1.0;   % e0_greek_gamma_j19_i2
PARAMS(41) = 0.0;   % e0_F_j1
PARAMS(42) = 0.0;   % e0_F_j19
PARAMS(43) = 0.0;   % e0_F_j21
PARAMS(44) = 0.0;   % e0_F_j20
PARAMS(45) = 0.0;   % e0_F_j16
PARAMS(46) = 0.0;   % e0_F_j15
PARAMS(47) = 0.0;   % e0_F_j18
PARAMS(48) = 0.0;   % e0_F_j17
PARAMS(49) = 1.0;   % e0_greek_gamma_j35_i2
PARAMS(50) = 1.0;   % e0_greek_gamma_j35_i1
PARAMS(51) = 1.0;   % e0_greek_gamma_j36_i2
PARAMS(52) = 1.0;   % e0_greek_gamma_j36_i1
PARAMS(53) = 0.0;   % e0_F_j23
PARAMS(54) = 0.67;      % e0_z_i2
PARAMS(55) = 0.0;   % e0_F_j22
PARAMS(56) = 0.33;      % e0_z_i1
PARAMS(57) = 1.0;   % e0_greek_gamma_j32_i2
PARAMS(58) = 1.0;   % e0_greek_gamma_j32_i1
PARAMS(59) = 1.0;   % e0_greek_gamma_j33_i2
PARAMS(60) = 1.0;   % e0_greek_gamma_j33_i1
PARAMS(61) = 1.0;   % e0_greek_gamma_j34_i2
PARAMS(62) = 1.0;   % e0_greek_gamma_j34_i1
PARAMS(63) = 0.0;   % e0_F_j24
PARAMS(64) = 0.0;   % e0_F_j2
PARAMS(65) = 0.0;   % e0_F_j29
PARAMS(66) = 0.0;   % e0_F_j31
PARAMS(67) = 0.0;   % e0_F_j30
PARAMS(68) = 0.0;   % e0_F_j26
PARAMS(69) = 1080.0;    % e0_F_j25
PARAMS(70) = 0.0;   % e0_F_j28
PARAMS(71) = 0.0;   % e0_F_j27
PARAMS(72) = 1.0;   % e0_greek_gamma_j30_i1
PARAMS(73) = 1.0;   % e0_greek_gamma_j3_i2
PARAMS(74) = 1.0;   % e0_greek_gamma_j31_i1
PARAMS(75) = 1.0;   % e0_greek_gamma_j30_i2
PARAMS(76) = 1.0;   % e0_greek_gamma_j31_i2
PARAMS(77) = 0.0;   % e0_F_j32
PARAMS(78) = 1.0;   % e0_greek_gamma_j28_i1
PARAMS(79) = 1.0;   % e0_greek_gamma_j29_i1
PARAMS(80) = 1.0;   % e0_greek_gamma_j28_i2
PARAMS(81) = 1.0;   % e0_greek_gamma_j3_i1
PARAMS(82) = 1.0;   % e0_greek_gamma_j29_i2
PARAMS(83) = 0.0;   % e0_F_j34
PARAMS(84) = 0.0;   % e0_F_j33
PARAMS(85) = 1.0;   % e0_greek_gamma_j13_i2
PARAMS(86) = 0.0;   % e0_F_j3
PARAMS(87) = 0.0;   % e0_F_j39
PARAMS(88) = 1.0;   % e0_greek_gamma_j12_i2
PARAMS(89) = 0.0;   % e0_F_j41
PARAMS(90) = 1.0;   % e0_greek_gamma_j13_i1
PARAMS(91) = 0.0;   % e0_F_j40
PARAMS(92) = 0.0;   % e0_F_j36
PARAMS(93) = 0.0;   % e0_F_j35
PARAMS(94) = 0.0;   % e0_F_j38
PARAMS(95) = 0.0;   % e0_F_j37
PARAMS(96) = 1.0;   % e0_greek_gamma_j1_i2
```

```
    PARAMS(97) = 1.0;   % e0_greek_gamma_j10_i1
    PARAMS(98) = 1.0;   % e0_greek_gamma_j45_i1
    PARAMS(99) = 1.0;   % e0_greek_gamma_j1_i1
    PARAMS(100) = 1.0;      % e0_greek_gamma_j45_i2
    PARAMS(101) = 1.0;      % e0_greek_gamma_j11_i2
    PARAMS(102) = 1.0;      % e0_greek_gamma_j12_i1
    PARAMS(103) = 1.0;      % e0_greek_gamma_j10_i2
    PARAMS(104) = 1.0;      % e0_greek_gamma_j11_i1
    PARAMS(105) = 1.0;      % e0_greek_gamma_j42_i1
    PARAMS(106) = 1.0;      % e0_greek_gamma_j42_i2
    PARAMS(107) = 1.0;      % e0_greek_gamma_j41_i1
    PARAMS(108) = 1.0;      % e0_greek_gamma_j41_i2
    PARAMS(109) = 1.0;      % e0_greek_gamma_j44_i1
    PARAMS(110) = 1.0;      % e0_greek_gamma_j44_i2
    PARAMS(111) = 1.0;      % e0_greek_gamma_j43_i1
    PARAMS(112) = 1.0;      % e0_greek_gamma_j43_i2
    PARAMS(113) = 0.0;      % e0_F_j42
    PARAMS(114) = 0.0;      % e0_F_j44
    PARAMS(115) = 0.0;      % e0_F_j43
    PARAMS(116) = 0.0;      % e0_F_j4
    PARAMS(117) = 0.0;      % e0_F_j49
    PARAMS(118) = 0.0;      % e0_F_j5
    PARAMS(119) = 0.0;      % e0_F_j46
    PARAMS(120) = 0.0;      % e0_F_j45
    PARAMS(121) = 0.0;      % e0_F_j48
    PARAMS(122) = 0.0;      % e0_F_j47
    PARAMS(123) = 1.0;      % e0_greek_gamma_j40_i2
    PARAMS(124) = 1.0;      % e0_greek_gamma_j4_i2
    PARAMS(125) = 1.0;      % e0_greek_gamma_j40_i1
    PARAMS(126) = 1.0;      % e0_greek_gamma_j37_i2
    PARAMS(127) = 1.0;      % e0_greek_gamma_j38_i1
    PARAMS(128) = 1.0;      % e0_greek_gamma_j37_i1
    PARAMS(129) = 1.0;      % e0_greek_gamma_j39_i2
    PARAMS(130) = 1.0;      % e0_greek_gamma_j4_i1
    PARAMS(131) = 1.0;      % e0_greek_gamma_j38_i2
    PARAMS(132) = 1.0;      % e0_greek_gamma_j39_i1
    PARAMS(133) = 0.0;      % e0_F_j7
    PARAMS(134) = 0.0;      % e0_F_j6
    PARAMS(135) = 0.0;      % e0_F_j9
    PARAMS(136) = 0.0;      % e0_F_j8
    PARAMS(137) = 1.0;      % e0_greek_gamma_j15_i2
    PARAMS(138) = 1.0;      % e0_greek_gamma_j15_i1
    PARAMS(139) = 1.0;      % e0_greek_gamma_j16_i2
    PARAMS(140) = 1.0;      % e0_greek_gamma_j16_i1
    PARAMS(141) = 1.0;      % e0_greek_gamma_j17_i2
    PARAMS(142) = 1.0;      % e0_greek_gamma_j17_i1
    PARAMS(143) = 1.0;      % e0_greek_gamma_j18_i2
    PARAMS(144) = 1.0;      % e0_greek_gamma_j18_i1
    PARAMS(145) = 1.0;      % e0_greek_gamma_j8_i1
    PARAMS(146) = 1.0;      % e0_greek_gamma_j8_i2
    PARAMS(147) = 1.0;      % e0_greek_gamma_j7_i1
    PARAMS(148) = 1.0;      % e0_greek_gamma_j7_i2
    PARAMS(149) = 30781.0;      % e0_greek_lambda_b_i1
    PARAMS(150) = 33201.0;      % e0_greek_lambda_b_i2
    PARAMS(151) = 1.0;      % e0_greek_gamma_j14_i2
    PARAMS(152) = 1.0;      % e0_greek_gamma_j9_i1
    PARAMS(153) = 1.0;      % e0_greek_gamma_j14_i1
    PARAMS(154) = 1.0;      % e0_greek_gamma_j9_i2
    PARAMS(155) = 1.0;      % e0_greek_gamma_j6_i1
    PARAMS(156) = 1.0;      % e0_greek_gamma_j6_i2
    PARAMS(157) = 90.0;     % e0_P
    PARAMS(158) = 1.0;      % e0_greek_gamma_j5_i2
    PARAMS(159) = 1.20773;      % e0_R_c
    PARAMS(160) = 1.6750992E7;      % e0_Q_r
    PARAMS(161) = 835.25;   % e0_T_c_i1
    PARAMS(162) = 353.25;   % e0_T_b_i1
    PARAMS(163) = 1.0;      % e0_greek_gamma_j47_i2
    PARAMS(164) = 1.0;      % e0_greek_gamma_j48_i1
    PARAMS(165) = 1.0;      % e0_greek_gamma_j46_i2
    PARAMS(166) = 1.0;      % e0_greek_gamma_j47_i1
    PARAMS(167) = 1.0;      % e0_greek_gamma_j49_i2
    PARAMS(168) = 1.0;      % e0_greek_gamma_j5_i1
    PARAMS(169) = 1.0;      % e0_greek_gamma_j48_i2
    PARAMS(170) = 1.0;      % e0_greek_gamma_j49_i1
    PARAMS(171) = 1.0;      % e0_greek_gamma_j46_i1

    options = optimset('MaxIter',1000,'TolFun',1e-6,'Display','Iter');
    RES = fsolve (@( x_iter )getFunVal(x_iter,PARAMS),X_ITER,options);

    ROOTS = getFunVal(RES,PARAMS);
    ROOTS = ROOTS';

    displayResults(RES);

end


function[Y] = getFunVal(X_ITER,PARAMS)

%
% Calculate the function value of a normalized equation system.
%
    % read out variables
    e0_B_r = X_ITER(1);
    e0_D_c = X_ITER(2);
    e0_L_j0 = X_ITER(3);
    e0_L_j10 = X_ITER(4);
    e0_L_j11 = X_ITER(5);
    e0_L_j12 = X_ITER(6);
    e0_L_j13 = X_ITER(7);
    e0_L_j14 = X_ITER(8);
    e0_L_j15 = X_ITER(9);
    e0_L_j16 = X_ITER(10);
```

```
e0_L_j17 = X_ITER(11);
e0_L_j18 = X_ITER(12);
e0_L_j19 = X_ITER(13);
e0_L_j1 = X_ITER(14);
e0_L_j20 = X_ITER(15);
e0_L_j21 = X_ITER(16);
e0_L_j22 = X_ITER(17);
e0_L_j23 = X_ITER(18);
e0_L_j24 = X_ITER(19);
e0_L_j25 = X_ITER(20);
e0_L_j26 = X_ITER(21);
e0_L_j27 = X_ITER(22);
e0_L_j28 = X_ITER(23);
e0_L_j29 = X_ITER(24);
e0_L_j2 = X_ITER(25);
e0_L_j30 = X_ITER(26);
e0_L_j31 = X_ITER(27);
e0_L_j32 = X_ITER(28);
e0_L_j33 = X_ITER(29);
e0_L_j34 = X_ITER(30);
e0_L_j35 = X_ITER(31);
e0_L_j36 = X_ITER(32);
e0_L_j37 = X_ITER(33);
e0_L_j38 = X_ITER(34);
e0_L_j39 = X_ITER(35);
e0_L_j3 = X_ITER(36);
e0_L_j40 = X_ITER(37);
e0_L_j41 = X_ITER(38);
e0_L_j42 = X_ITER(39);
e0_L_j43 = X_ITER(40);
e0_L_j44 = X_ITER(41);
e0_L_j45 = X_ITER(42);
e0_L_j46 = X_ITER(43);
e0_L_j47 = X_ITER(44);
e0_L_j48 = X_ITER(45);
e0_L_j49 = X_ITER(46);
e0_L_j4 = X_ITER(47);
e0_L_j5 = X_ITER(48);
e0_L_j6 = X_ITER(49);
e0_L_j7 = X_ITER(50);
e0_L_j8 = X_ITER(51);
e0_L_j9 = X_ITER(52);
e0_Q_c = X_ITER(53);
e0_T_j0 = X_ITER(54);
e0_T_j10 = X_ITER(55);
e0_T_j11 = X_ITER(56);
e0_T_j12 = X_ITER(57);
e0_T_j13 = X_ITER(58);
e0_T_j14 = X_ITER(59);
e0_T_j15 = X_ITER(60);
e0_T_j16 = X_ITER(61);
e0_T_j17 = X_ITER(62);
e0_T_j18 = X_ITER(63);
e0_T_j19 = X_ITER(64);
e0_T_j1 = X_ITER(65);
e0_T_j20 = X_ITER(66);
e0_T_j21 = X_ITER(67);
e0_T_j22 = X_ITER(68);
e0_T_j23 = X_ITER(69);
e0_T_j24 = X_ITER(70);
e0_T_j25 = X_ITER(71);
e0_T_j26 = X_ITER(72);
e0_T_j27 = X_ITER(73);
e0_T_j28 = X_ITER(74);
e0_T_j29 = X_ITER(75);
e0_T_j2 = X_ITER(76);
e0_T_j30 = X_ITER(77);
e0_T_j31 = X_ITER(78);
e0_T_j32 = X_ITER(79);
e0_T_j33 = X_ITER(80);
e0_T_j34 = X_ITER(81);
e0_T_j35 = X_ITER(82);
e0_T_j36 = X_ITER(83);
e0_T_j37 = X_ITER(84);
e0_T_j38 = X_ITER(85);
e0_T_j39 = X_ITER(86);
e0_T_j3 = X_ITER(87);
e0_T_j40 = X_ITER(88);
e0_T_j41 = X_ITER(89);
e0_T_j42 = X_ITER(90);
e0_T_j43 = X_ITER(91);
e0_T_j44 = X_ITER(92);
e0_T_j45 = X_ITER(93);
e0_T_j46 = X_ITER(94);
e0_T_j47 = X_ITER(95);
e0_T_j48 = X_ITER(96);
e0_T_j49 = X_ITER(97);
e0_T_j4 = X_ITER(98);
e0_T_j5 = X_ITER(99);
e0_T_j6 = X_ITER(100);
e0_T_j7 = X_ITER(101);
e0_T_j8 = X_ITER(102);
e0_T_j9 = X_ITER(103);
e0_V_j10 = X_ITER(104);
e0_V_j11 = X_ITER(105);
e0_V_j12 = X_ITER(106);
e0_V_j13 = X_ITER(107);
e0_V_j14 = X_ITER(108);
e0_V_j15 = X_ITER(109);
e0_V_j16 = X_ITER(110);
e0_V_j17 = X_ITER(111);
e0_V_j18 = X_ITER(112);
e0_V_j19 = X_ITER(113);
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```
e0_V_j1 = X_ITER(114);
e0_V_j20 = X_ITER(115);
e0_V_j21 = X_ITER(116);
e0_V_j22 = X_ITER(117);
e0_V_j23 = X_ITER(118);
e0_V_j24 = X_ITER(119);
e0_V_j25 = X_ITER(120);
e0_V_j26 = X_ITER(121);
e0_V_j27 = X_ITER(122);
e0_V_j28 = X_ITER(123);
e0_V_j29 = X_ITER(124);
e0_V_j2 = X_ITER(125);
e0_V_j30 = X_ITER(126);
e0_V_j31 = X_ITER(127);
e0_V_j32 = X_ITER(128);
e0_V_j33 = X_ITER(129);
e0_V_j34 = X_ITER(130);
e0_V_j35 = X_ITER(131);
e0_V_j36 = X_ITER(132);
e0_V_j37 = X_ITER(133);
e0_V_j38 = X_ITER(134);
e0_V_j39 = X_ITER(135);
e0_V_j3 = X_ITER(136);
e0_V_j40 = X_ITER(137);
e0_V_j41 = X_ITER(138);
e0_V_j42 = X_ITER(139);
e0_V_j43 = X_ITER(140);
e0_V_j44 = X_ITER(141);
e0_V_j45 = X_ITER(142);
e0_V_j46 = X_ITER(143);
e0_V_j47 = X_ITER(144);
e0_V_j48 = X_ITER(145);
e0_V_j49 = X_ITER(146);
e0_V_j4 = X_ITER(147);
e0_V_j50 = X_ITER(148);
e0_V_j5 = X_ITER(149);
e0_V_j6 = X_ITER(150);
e0_V_j7 = X_ITER(151);
e0_V_j8 = X_ITER(152);
e0_V_j9 = X_ITER(153);
e0_h_F = X_ITER(154);
e0_h_V_j50 = X_ITER(155);
e0_x_j0_i1 = X_ITER(156);
e0_x_j0_i2 = X_ITER(157);
e0_x_j1_i1 = X_ITER(158);
e0_x_j1_i2 = X_ITER(159);
e0_x_j10_i1 = X_ITER(160);
e0_x_j10_i2 = X_ITER(161);
e0_x_j11_i1 = X_ITER(162);
e0_x_j11_i2 = X_ITER(163);
e0_x_j12_i1 = X_ITER(164);
e0_x_j12_i2 = X_ITER(165);
e0_x_j13_i1 = X_ITER(166);
e0_x_j13_i2 = X_ITER(167);
e0_x_j14_i1 = X_ITER(168);
e0_x_j14_i2 = X_ITER(169);
e0_x_j15_i1 = X_ITER(170);
e0_x_j15_i2 = X_ITER(171);
e0_x_j16_i1 = X_ITER(172);
e0_x_j16_i2 = X_ITER(173);
e0_x_j17_i1 = X_ITER(174);
e0_x_j17_i2 = X_ITER(175);
e0_x_j18_i1 = X_ITER(176);
e0_x_j18_i2 = X_ITER(177);
e0_x_j19_i1 = X_ITER(178);
e0_x_j19_i2 = X_ITER(179);
e0_x_j2_i1 = X_ITER(180);
e0_x_j2_i2 = X_ITER(181);
e0_x_j20_i1 = X_ITER(182);
e0_x_j20_i2 = X_ITER(183);
e0_x_j21_i1 = X_ITER(184);
e0_x_j21_i2 = X_ITER(185);
e0_x_j22_i1 = X_ITER(186);
e0_x_j22_i2 = X_ITER(187);
e0_x_j23_i1 = X_ITER(188);
e0_x_j23_i2 = X_ITER(189);
e0_x_j24_i1 = X_ITER(190);
e0_x_j24_i2 = X_ITER(191);
e0_x_j25_i1 = X_ITER(192);
e0_x_j25_i2 = X_ITER(193);
e0_x_j26_i1 = X_ITER(194);
e0_x_j26_i2 = X_ITER(195);
e0_x_j27_i1 = X_ITER(196);
e0_x_j27_i2 = X_ITER(197);
e0_x_j28_i1 = X_ITER(198);
e0_x_j28_i2 = X_ITER(199);
e0_x_j29_i1 = X_ITER(200);
e0_x_j29_i2 = X_ITER(201);
e0_x_j3_i1 = X_ITER(202);
e0_x_j3_i2 = X_ITER(203);
e0_x_j30_i1 = X_ITER(204);
e0_x_j30_i2 = X_ITER(205);
e0_x_j31_i1 = X_ITER(206);
e0_x_j31_i2 = X_ITER(207);
e0_x_j32_i1 = X_ITER(208);
e0_x_j32_i2 = X_ITER(209);
e0_x_j33_i1 = X_ITER(210);
e0_x_j33_i2 = X_ITER(211);
e0_x_j34_i1 = X_ITER(212);
e0_x_j34_i2 = X_ITER(213);
e0_x_j35_i1 = X_ITER(214);
e0_x_j35_i2 = X_ITER(215);
e0_x_j36_i1 = X_ITER(216);
```

```
e0_x_j36_i2 = X_ITER(217);
e0_x_j37_i1 = X_ITER(218);
e0_x_j37_i2 = X_ITER(219);
e0_x_j38_i1 = X_ITER(220);
e0_x_j38_i2 = X_ITER(221);
e0_x_j39_i1 = X_ITER(222);
e0_x_j39_i2 = X_ITER(223);
e0_x_j4_i1 = X_ITER(224);
e0_x_j4_i2 = X_ITER(225);
e0_x_j40_i1 = X_ITER(226);
e0_x_j40_i2 = X_ITER(227);
e0_x_j41_i1 = X_ITER(228);
e0_x_j41_i2 = X_ITER(229);
e0_x_j42_i1 = X_ITER(230);
e0_x_j42_i2 = X_ITER(231);
e0_x_j43_i1 = X_ITER(232);
e0_x_j43_i2 = X_ITER(233);
e0_x_j44_i1 = X_ITER(234);
e0_x_j44_i2 = X_ITER(235);
e0_x_j45_i1 = X_ITER(236);
e0_x_j45_i2 = X_ITER(237);
e0_x_j46_i1 = X_ITER(238);
e0_x_j46_i2 = X_ITER(239);
e0_x_j47_i1 = X_ITER(240);
e0_x_j47_i2 = X_ITER(241);
e0_x_j48_i1 = X_ITER(242);
e0_x_j48_i2 = X_ITER(243);
e0_x_j49_i1 = X_ITER(244);
e0_x_j49_i2 = X_ITER(245);
e0_x_j5_i1 = X_ITER(246);
e0_x_j5_i2 = X_ITER(247);
e0_x_j6_i1 = X_ITER(248);
e0_x_j6_i2 = X_ITER(249);
e0_x_j7_i1 = X_ITER(250);
e0_x_j7_i2 = X_ITER(251);
e0_x_j8_i1 = X_ITER(252);
e0_x_j8_i2 = X_ITER(253);
e0_x_j9_i1 = X_ITER(254);
e0_x_j9_i2 = X_ITER(255);
e0_y_j1_i1 = X_ITER(256);
e0_y_j1_i2 = X_ITER(257);
e0_y_j10_i1 = X_ITER(258);
e0_y_j10_i2 = X_ITER(259);
e0_y_j11_i1 = X_ITER(260);
e0_y_j11_i2 = X_ITER(261);
e0_y_j12_i1 = X_ITER(262);
e0_y_j12_i2 = X_ITER(263);
e0_y_j13_i1 = X_ITER(264);
e0_y_j13_i2 = X_ITER(265);
   e0_y_j14_i1 = X_ITER(266);
e0_y_j14_i2 = X_ITER(267);
e0_y_j15_i1 = X_ITER(268);
e0_y_j15_i2 = X_ITER(269);
e0_y_j16_i1 = X_ITER(270);
e0_y_j16_i2 = X_ITER(271);
e0_y_j17_i1 = X_ITER(272);
e0_y_j17_i2 = X_ITER(273);
e0_y_j18_i1 = X_ITER(274);
e0_y_j18_i2 = X_ITER(275);
e0_y_j19_i1 = X_ITER(276);
e0_y_j19_i2 = X_ITER(277);
e0_y_j2_i1 = X_ITER(278);
e0_y_j2_i2 = X_ITER(279);
e0_y_j20_i1 = X_ITER(280);
e0_y_j20_i2 = X_ITER(281);
e0_y_j21_i1 = X_ITER(282);
e0_y_j21_i2 = X_ITER(283);
e0_y_j22_i1 = X_ITER(284);
e0_y_j22_i2 = X_ITER(285);
e0_y_j23_i1 = X_ITER(286);
e0_y_j23_i2 = X_ITER(287);
e0_y_j24_i1 = X_ITER(288);
e0_y_j24_i2 = X_ITER(289);
e0_y_j25_i1 = X_ITER(290);
e0_y_j25_i2 = X_ITER(291);
e0_y_j26_i1 = X_ITER(292);
e0_y_j26_i2 = X_ITER(293);
e0_y_j27_i1 = X_ITER(294);
e0_y_j27_i2 = X_ITER(295);
e0_y_j28_i1 = X_ITER(296);
e0_y_j28_i2 = X_ITER(297);
e0_y_j29_i1 = X_ITER(298);
e0_y_j29_i2 = X_ITER(299);
e0_y_j3_i1 = X_ITER(300);
e0_y_j3_i2 = X_ITER(301);
e0_y_j30_i1 = X_ITER(302);
e0_y_j30_i2 = X_ITER(303);
e0_y_j31_i1 = X_ITER(304);
e0_y_j31_i2 = X_ITER(305);
e0_y_j32_i1 = X_ITER(306);
e0_y_j32_i2 = X_ITER(307);
e0_y_j33_i1 = X_ITER(308);
e0_y_j33_i2 = X_ITER(309);
e0_y_j34_i1 = X_ITER(310);
e0_y_j34_i2 = X_ITER(311);
e0_y_j35_i1 = X_ITER(312);
e0_y_j35_i2 = X_ITER(313);
e0_y_j36_i1 = X_ITER(314);
e0_y_j36_i2 = X_ITER(315);
e0_y_j37_i1 = X_ITER(316);
e0_y_j37_i2 = X_ITER(317);
e0_y_j38_i1 = X_ITER(318);
e0_y_j38_i2 = X_ITER(319);
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e0_y_j39_i1 = X_ITER(320);
e0_y_j39_i2 = X_ITER(321);
e0_y_j4_i1 = X_ITER(322);
e0_y_j4_i2 = X_ITER(323);
e0_y_j40_i1 = X_ITER(324);
e0_y_j40_i2 = X_ITER(325);
e0_y_j41_i1 = X_ITER(326);
e0_y_j41_i2 = X_ITER(327);
e0_y_j42_i1 = X_ITER(328);
e0_y_j42_i2 = X_ITER(329);
e0_y_j43_i1 = X_ITER(330);
e0_y_j43_i2 = X_ITER(331);
e0_y_j44_i1 = X_ITER(332);
e0_y_j44_i2 = X_ITER(333);
e0_y_j45_i1 = X_ITER(334);
e0_y_j45_i2 = X_ITER(335);
e0_y_j46_i1 = X_ITER(336);
e0_y_j46_i2 = X_ITER(337);
e0_y_j47_i1 = X_ITER(338);
e0_y_j47_i2 = X_ITER(339);
e0_y_j48_i1 = X_ITER(340);
e0_y_j48_i2 = X_ITER(341);
e0_y_j49_i1 = X_ITER(342);
e0_y_j49_i2 = X_ITER(343);
e0_y_j5_i1 = X_ITER(344);
e0_y_j5_i2 = X_ITER(345);
e0_y_j50_i1 = X_ITER(346);
e0_y_j50_i2 = X_ITER(347);
e0_y_j6_i1 = X_ITER(348);
e0_y_j6_i2 = X_ITER(349);
e0_y_j7_i1 = X_ITER(350);
e0_y_j7_i2 = X_ITER(351);
e0_y_j8_i1 = X_ITER(352);
e0_y_j8_i2 = X_ITER(353);
e0_y_j9_i1 = X_ITER(354);
e0_y_j9_i2 = X_ITER(355);

% read out parameters
e0_A_i2 = PARAMS(1);
e0_A_L_i1 = PARAMS(2);
e0_A_L_i2 = PARAMS(3);
e0_T_b_i2 = PARAMS(4);
e0_A_i1 = PARAMS(5);
e0_greek_phi = PARAMS(6);
e0_T_c_i2 = PARAMS(7);
e0_greek_gamma_j25_i2 = PARAMS(8);
e0_greek_gamma_j25_i1 = PARAMS(9);
e0_greek_gamma_j26_i2 = PARAMS(10);
e0_greek_gamma_j26_i1 = PARAMS(11);
e0_greek_gamma_j27_i2 = PARAMS(12);
e0_B_L_i1 = PARAMS(13);
e0_greek_gamma_j27_i1 = PARAMS(14);
e0_B_i1 = PARAMS(15);
e0_B_L_i2 = PARAMS(16);
e0_B_i2 = PARAMS(17);
e0_greek_gamma_j23_i2 = PARAMS(18);
e0_greek_gamma_j23_i1 = PARAMS(19);
e0_greek_gamma_j24_i2 = PARAMS(20);
e0_greek_gamma_j24_i1 = PARAMS(21);
e0_C_L_i2 = PARAMS(22);
e0_F_j11 = PARAMS(23);
e0_F_j10 = PARAMS(24);
e0_C_i1 = PARAMS(25);
e0_C_i2 = PARAMS(26);
e0_C_L_i1 = PARAMS(27);
e0_greek_gamma_j20_i1 = PARAMS(28);
e0_greek_gamma_j2_i2 = PARAMS(29);
e0_greek_gamma_j21_i1 = PARAMS(30);
e0_greek_gamma_j20_i2 = PARAMS(31);
e0_greek_gamma_j22_i1 = PARAMS(32);
e0_F_j13 = PARAMS(33);
e0_greek_gamma_j21_i2 = PARAMS(34);
e0_F_j12 = PARAMS(35);
e0_greek_gamma_j22_i2 = PARAMS(36);
e0_F_j14 = PARAMS(37);
e0_greek_gamma_j19_i1 = PARAMS(38);
e0_greek_gamma_j2_i1 = PARAMS(39);
e0_greek_gamma_j19_i2 = PARAMS(40);
e0_F_j1 = PARAMS(41);
e0_F_j19 = PARAMS(42);
e0_F_j21 = PARAMS(43);
e0_F_j20 = PARAMS(44);
e0_F_j16 = PARAMS(45);
e0_F_j15 = PARAMS(46);
e0_F_j18 = PARAMS(47);
e0_F_j17 = PARAMS(48);
e0_greek_gamma_j35_i2 = PARAMS(49);
e0_greek_gamma_j35_i1 = PARAMS(50);
e0_greek_gamma_j36_i2 = PARAMS(51);
e0_greek_gamma_j36_i1 = PARAMS(52);
e0_F_j23 = PARAMS(53);
e0_z_i2 = PARAMS(54);
e0_F_j22 = PARAMS(55);
e0_z_i1 = PARAMS(56);
e0_greek_gamma_j32_i2 = PARAMS(57);
e0_greek_gamma_j32_i1 = PARAMS(58);
e0_greek_gamma_j33_i2 = PARAMS(59);
e0_greek_gamma_j33_i1 = PARAMS(60);
e0_greek_gamma_j34_i2 = PARAMS(61);
e0_greek_gamma_j34_i1 = PARAMS(62);
e0_F_j24 = PARAMS(63);
e0_F_j2 = PARAMS(64);
e0_F_j29 = PARAMS(65);
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e0_F_j31 = PARAMS(66);
e0_F_j30 = PARAMS(67);
e0_F_j26 = PARAMS(68);
e0_F_j25 = PARAMS(69);
e0_F_j28 = PARAMS(70);
e0_F_j27 = PARAMS(71);
e0_greek_gamma_j30_i1 = PARAMS(72);
e0_greek_gamma_j3_i2 = PARAMS(73);
e0_greek_gamma_j31_i1 = PARAMS(74);
e0_greek_gamma_j30_i2 = PARAMS(75);
e0_greek_gamma_j31_i2 = PARAMS(76);
e0_F_j32 = PARAMS(77);
e0_greek_gamma_j28_i1 = PARAMS(78);
e0_greek_gamma_j29_i1 = PARAMS(79);
e0_greek_gamma_j28_i2 = PARAMS(80);
e0_greek_gamma_j3_i1 = PARAMS(81);
e0_greek_gamma_j29_i2 = PARAMS(82);
e0_F_j34 = PARAMS(83);
e0_F_j33 = PARAMS(84);
e0_greek_gamma_j13_i2 = PARAMS(85);
e0_F_j3 = PARAMS(86);
e0_F_j39 = PARAMS(87);
e0_greek_gamma_j12_i2 = PARAMS(88);
e0_F_j41 = PARAMS(89);
e0_greek_gamma_j13_i1 = PARAMS(90);
e0_F_j40 = PARAMS(91);
e0_F_j36 = PARAMS(92);
e0_F_j35 = PARAMS(93);
e0_F_j38 = PARAMS(94);
e0_F_j37 = PARAMS(95);
e0_greek_gamma_j1_i2 = PARAMS(96);
e0_greek_gamma_j10_i1 = PARAMS(97);
e0_greek_gamma_j45_i1 = PARAMS(98);
e0_greek_gamma_j1_i1 = PARAMS(99);
e0_greek_gamma_j45_i2 = PARAMS(100);
e0_greek_gamma_j11_i2 = PARAMS(101);
e0_greek_gamma_j12_i1 = PARAMS(102);
e0_greek_gamma_j10_i2 = PARAMS(103);
e0_greek_gamma_j11_i1 = PARAMS(104);
e0_greek_gamma_j42_i1 = PARAMS(105);
e0_greek_gamma_j42_i2 = PARAMS(106);
e0_greek_gamma_j41_i1 = PARAMS(107);
e0_greek_gamma_j41_i2 = PARAMS(108);
e0_greek_gamma_j44_i1 = PARAMS(109);
e0_greek_gamma_j44_i2 = PARAMS(110);
e0_greek_gamma_j43_i1 = PARAMS(111);
e0_greek_gamma_j43_i2 = PARAMS(112);
e0_F_j42 = PARAMS(113);
e0_F_j44 = PARAMS(114);
e0_F_j43 = PARAMS(115);
e0_F_j4 = PARAMS(116);
e0_F_j49 = PARAMS(117);
e0_F_j5 = PARAMS(118);
e0_F_j46 = PARAMS(119);
e0_F_j45 = PARAMS(120);
e0_F_j48 = PARAMS(121);
e0_F_j47 = PARAMS(122);
e0_greek_gamma_j40_i2 = PARAMS(123);
e0_greek_gamma_j4_i2 = PARAMS(124);
e0_greek_gamma_j40_i1 = PARAMS(125);
e0_greek_gamma_j37_i2 = PARAMS(126);
e0_greek_gamma_j38_i1 = PARAMS(127);
e0_greek_gamma_j37_i1 = PARAMS(128);
e0_greek_gamma_j39_i2 = PARAMS(129);
e0_greek_gamma_j4_i1 = PARAMS(130);
e0_greek_gamma_j38_i2 = PARAMS(131);
e0_greek_gamma_j39_i1 = PARAMS(132);
e0_F_j7 = PARAMS(133);
e0_F_j6 = PARAMS(134);
e0_F_j9 = PARAMS(135);
e0_F_j8 = PARAMS(136);
e0_greek_gamma_j15_i2 = PARAMS(137);
e0_greek_gamma_j15_i1 = PARAMS(138);
e0_greek_gamma_j16_i2 = PARAMS(139);
e0_greek_gamma_j16_i1 = PARAMS(140);
e0_greek_gamma_j17_i2 = PARAMS(141);
e0_greek_gamma_j17_i1 = PARAMS(142);
e0_greek_gamma_j18_i2 = PARAMS(143);
e0_greek_gamma_j18_i1 = PARAMS(144);
e0_greek_gamma_j8_i1 = PARAMS(145);
e0_greek_gamma_j8_i2 = PARAMS(146);
e0_greek_gamma_j7_i1 = PARAMS(147);
e0_greek_gamma_j7_i2 = PARAMS(148);
e0_greek_lambda_b_i1 = PARAMS(149);
e0_greek_lambda_b_i2 = PARAMS(150);
e0_greek_gamma_j14_i2 = PARAMS(151);
e0_greek_gamma_j9_i1 = PARAMS(152);
e0_greek_gamma_j14_i1 = PARAMS(153);
e0_greek_gamma_j9_i2 = PARAMS(154);
e0_greek_gamma_j6_i1 = PARAMS(155);
e0_greek_gamma_j6_i2 = PARAMS(156);
e0_P = PARAMS(157);
e0_greek_gamma_j5_i2 = PARAMS(158);
e0_R_c = PARAMS(159);
e0_Q_r = PARAMS(160);
e0_T_c_i1 = PARAMS(161);
e0_T_b_i1 = PARAMS(162);
e0_greek_gamma_j47_i2 = PARAMS(163);
e0_greek_gamma_j48_i1 = PARAMS(164);
e0_greek_gamma_j46_i2 = PARAMS(165);
e0_greek_gamma_j47_i1 = PARAMS(166);
e0_greek_gamma_j49_i2 = PARAMS(167);
e0_greek_gamma_j5_i1 = PARAMS(168);
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    e0_greek_gamma_j48_i2 = PARAMS(169);
    e0_greek_gamma_j49_i1 = PARAMS(170);
    e0_greek_gamma_j46_i1 = PARAMS(171);

    % perform direct function calls
    e0_h_v_j45_i1 =
fun_47210__function(e0_T_j45,e0_greek_lambda_b_i1,e0_A_L_i1,e0_B_L_i1,e0_C_L_i1,e0_T_b_i1,e0_T_c_i1) ;
    e0_P_o_j40_i1 = fun_47218__function(e0_T_j40,e0_C_i1,e0_B_i1,e0_A_i1) ;
    e0_h_l_j32_i1 = fun_47216__function(e0_T_j32,e0_C_L_i1,e0_B_L_i1,e0_A_L_i1) ;
    e0_P_o_j29_i2 = fun_47218__function(e0_T_j29,e0_C_i2,e0_B_i2,e0_A_i2) ;
    e0_h_l_j45_i1 = fun_47216__function(e0_T_j45,e0_C_L_i1,e0_B_L_i1,e0_A_L_i1) ;
    e0_h_v_j18_i2 =
fun_47210__function(e0_T_j18,e0_greek_lambda_b_i2,e0_A_L_i2,e0_B_L_i2,e0_C_L_i2,e0_T_b_i2,e0_T_c_i2) ;
    e0_h_v_j6_i1 = fun_47210__function(e0_T_j6,e0_greek_lambda_b_i1,e0_A_L_i1,e0_B_L_i1,e0_C_L_i1,e0_T_b_i1,e0_T_c_i1)
;
    e0_h_v_j5_i2 = fun_47210__function(e0_T_j5,e0_greek_lambda_b_i2,e0_A_L_i2,e0_B_L_i2,e0_C_L_i2,e0_T_b_i2,e0_T_c_i2)
;
    e0_h_l_j19_i1 = fun_47216__function(e0_T_j19,e0_C_L_i1,e0_B_L_i1,e0_A_L_i1) ;
    e0_h_v_j19_i1 =
fun_47210__function(e0_T_j19,e0_greek_lambda_b_i1,e0_A_L_i1,e0_B_L_i1,e0_C_L_i1,e0_T_b_i1,e0_T_c_i1) ;
    e0_h_v_j32_i1 =
fun_47210__function(e0_T_j32,e0_greek_lambda_b_i1,e0_A_L_i1,e0_B_L_i1,e0_C_L_i1,e0_T_b_i1,e0_T_c_i1) ;
    e0_h_l_j42_i1 = fun_47216__function(e0_T_j42,e0_C_L_i1,e0_B_L_i1,e0_A_L_i1) ;
    e0_h_v_j31_i2 =
fun_47210__function(e0_T_j31,e0_greek_lambda_b_i2,e0_A_L_i2,e0_B_L_i2,e0_C_L_i2,e0_T_b_i2,e0_T_c_i2) ;
    e0_P_o_j32_i2 = fun_47218__function(e0_T_j32,e0_C_i2,e0_B_i2,e0_A_i2) ;
    e0_h_l_j31_i2 = fun_47216__function(e0_T_j31,e0_C_L_i2,e0_B_L_i2,e0_A_L_i2) ;
    e0_h_v_j42_i1 =
fun_47210__function(e0_T_j42,e0_greek_lambda_b_i1,e0_A_L_i1,e0_B_L_i1,e0_C_L_i1,e0_T_b_i1,e0_T_c_i1) ;
    e0_P_o_j6_i2 = fun_47218__function(e0_T_j6,e0_C_i2,e0_B_i2,e0_A_i2) ;
    e0_h_l_j18_i2 = fun_47216__function(e0_T_j18,e0_C_L_i2,e0_B_L_i2,e0_A_L_i2) ;
    e0_P_o_j42_i2 = fun_47218__function(e0_T_j42,e0_C_i2,e0_B_i2,e0_A_i2) ;
    e0_h_v_j9_i1 = fun_47210__function(e0_T_j9,e0_greek_lambda_b_i1,e0_A_L_i1,e0_B_L_i1,e0_C_L_i1,e0_T_b_i1,e0_T_c_i1)
;
    e0_h_l_j8_i2 = fun_47216__function(e0_T_j8,e0_C_L_i2,e0_B_L_i2,e0_A_L_i2) ;
    e0_h_v_j8_i2 = fun_47210__function(e0_T_j8,e0_greek_lambda_b_i2,e0_A_L_i2,e0_B_L_i2,e0_C_L_i2,e0_T_b_i2,e0_T_c_i2)
;
    e0_h_l_j9_i1 = fun_47216__function(e0_T_j9,e0_C_L_i1,e0_B_L_i1,e0_A_L_i1) ;
    e0_h_l_j22_i1 = fun_47216__function(e0_T_j22,e0_C_L_i1,e0_B_L_i1,e0_A_L_i1) ;
    e0_P_o_j22_i2 = fun_47218__function(e0_T_j22,e0_C_i2,e0_B_i2,e0_A_i2) ;
    e0_h_l_j21_i2 = fun_47216__function(e0_T_j21,e0_C_L_i2,e0_B_L_i2,e0_A_L_i2) ;
    e0_h_l_j44_i2 = fun_47216__function(e0_T_j44,e0_C_L_i2,e0_B_L_i2,e0_A_L_i2) ;
    e0_h_v_j44_i2 =
fun_47210__function(e0_T_j44,e0_greek_lambda_b_i2,e0_A_L_i2,e0_B_L_i2,e0_C_L_i2,e0_T_b_i2,e0_T_c_i2) ;
    e0_P_o_j43_i1 = fun_47218__function(e0_T_j43,e0_C_i1,e0_B_i1,e0_A_i1) ;
    e0_P_o_j45_i2 = fun_47218__function(e0_T_j45,e0_C_i2,e0_B_i2,e0_A_i2) ;
    e0_h_v_j35_i2 =
fun_47210__function(e0_T_j35,e0_greek_lambda_b_i2,e0_A_L_i2,e0_B_L_i2,e0_C_L_i2,e0_T_b_i2,e0_T_c_i2) ;
    e0_P_o_j33_i1 = fun_47218__function(e0_T_j33,e0_C_i1,e0_B_i1,e0_A_i1) ;
    e0_h_l_j35_i2 = fun_47216__function(e0_T_j35,e0_C_L_i2,e0_B_L_i2,e0_A_L_i2) ;
    e0_h_v_j22_i1 =
fun_47210__function(e0_T_j22,e0_greek_lambda_b_i1,e0_A_L_i1,e0_B_L_i1,e0_C_L_i1,e0_T_b_i1,e0_T_c_i1) ;
    e0_h_v_j21_i2 =
fun_47210__function(e0_T_j21,e0_greek_lambda_b_i2,e0_A_L_i2,e0_B_L_i2,e0_C_L_i2,e0_T_b_i2,e0_T_c_i2) ;
    e0_P_o_j23_i1 = fun_47218__function(e0_T_j23,e0_C_i1,e0_B_i1,e0_A_i1) ;
    e0_h_v_j46_i1 =
fun_47210__function(e0_T_j46,e0_greek_lambda_b_i1,e0_A_L_i1,e0_B_L_i1,e0_C_L_i1,e0_T_b_i1,e0_T_c_i1) ;
    e0_P_o_j49_i1 = fun_47218__function(e0_T_j49,e0_C_i1,e0_B_i1,e0_A_i1) ;
    e0_P_o_j28_i2 = fun_47218__function(e0_T_j28,e0_C_i2,e0_B_i2,e0_A_i2) ;
    e0_P_o_j26_i1 = fun_47218__function(e0_T_j26,e0_C_i1,e0_B_i1,e0_A_i1) ;
    e0_P_o_j13_i1 = fun_47218__function(e0_T_j13,e0_C_i1,e0_B_i1,e0_A_i1) ;
    e0_h_l_j46_i1 = fun_47216__function(e0_T_j46,e0_C_L_i1,e0_B_L_i1,e0_A_L_i1) ;
    e0_P_o_j36_i1 = fun_47218__function(e0_T_j36,e0_C_i1,e0_B_i1,e0_A_i1) ;
    e0_P_o_j15_i2 = fun_47218__function(e0_T_j15,e0_C_i2,e0_B_i2,e0_A_i2) ;
    e0_P_o_j39_i1 = fun_47218__function(e0_T_j39,e0_C_i1,e0_B_i1,e0_A_i1) ;
    e0_h_l_j38_i2 = fun_47216__function(e0_T_j38,e0_C_L_i2,e0_B_L_i2,e0_A_L_i2) ;
    e0_h_v_j36_i1 =
fun_47210__function(e0_T_j36,e0_greek_lambda_b_i1,e0_A_L_i1,e0_B_L_i1,e0_C_L_i1,e0_T_b_i1,e0_T_c_i1) ;
    e0_h_v_j38_i2 =
fun_47210__function(e0_T_j38,e0_greek_lambda_b_i2,e0_A_L_i2,e0_B_L_i2,e0_C_L_i2,e0_T_b_i2,e0_T_c_i2) ;
    e0_h_l_j48_i2 = fun_47216__function(e0_T_j48,e0_C_L_i2,e0_B_L_i2,e0_A_L_i2) ;
    e0_h_l_j36_i1 = fun_47216__function(e0_T_j36,e0_C_L_i1,e0_B_L_i1,e0_A_L_i1) ;
    e0_h_v_j48_i2 =
fun_47210__function(e0_T_j48,e0_greek_lambda_b_i2,e0_A_L_i2,e0_B_L_i2,e0_C_L_i2,e0_T_b_i2,e0_T_c_i2) ;
    e0_P_o_j46_i1 = fun_47218__function(e0_T_j46,e0_C_i1,e0_B_i1,e0_A_i1) ;
    e0_P_o_j25_i2 = fun_47218__function(e0_T_j25,e0_C_i2,e0_B_i2,e0_A_i2) ;
    e0_P_o_j10_i1 = fun_47218__function(e0_T_j10,e0_C_i1,e0_B_i1,e0_A_i1) ;
    e0_P_o_j20_i1 = fun_47218__function(e0_T_j20,e0_C_i1,e0_B_i1,e0_A_i1) ;
    e0_P_o_j3_i1 = fun_47218__function(e0_T_j3,e0_C_i1,e0_B_i1,e0_A_i1) ;
    e0_h_l_j28_i2 = fun_47216__function(e0_T_j28,e0_C_L_i2,e0_B_L_i2,e0_A_L_i2) ;
    e0_h_v_j28_i2 =
fun_47210__function(e0_T_j28,e0_greek_lambda_b_i2,e0_A_L_i2,e0_B_L_i2,e0_C_L_i2,e0_T_b_i2,e0_T_c_i2) ;
    e0_P_o_j2_i2 = fun_47218__function(e0_T_j2,e0_C_i2,e0_B_i2,e0_A_i2) ;
    e0_P_o_j48_i2 = fun_47218__function(e0_T_j48,e0_C_i2,e0_B_i2,e0_A_i2) ;
    e0_P_o_j30_i1 = fun_47218__function(e0_T_j30,e0_C_i1,e0_B_i1,e0_A_i1) ;
    e0_P_o_j17_i1 = fun_47218__function(e0_T_j17,e0_C_i1,e0_B_i1,e0_A_i1) ;
    e0_P_o_j9_i2 = fun_47218__function(e0_T_j9,e0_C_i2,e0_B_i2,e0_A_i2) ;
    e0_P_o_j7_i1 = fun_47218__function(e0_T_j7,e0_C_i1,e0_B_i1,e0_A_i1) ;
    e0_P_o_j19_i2 = fun_47218__function(e0_T_j19,e0_C_i2,e0_B_i2,e0_A_i2) ;
    e0_h_v_j49_i1 =
fun_47210__function(e0_T_j49,e0_greek_lambda_b_i1,e0_A_L_i1,e0_B_L_i1,e0_C_L_i1,e0_T_b_i1,e0_T_c_i1) ;
    e0_P_o_j38_i2 = fun_47218__function(e0_T_j38,e0_C_i2,e0_B_i2,e0_A_i2) ;
    e0_P_o_j16_i1 = fun_47218__function(e0_T_j16,e0_C_i1,e0_B_i1,e0_A_i1) ;
    e0_h_l_j39_i1 = fun_47216__function(e0_T_j39,e0_C_L_i1,e0_B_L_i1,e0_A_L_i1) ;
    e0_h_v_j39_i1 =
fun_47210__function(e0_T_j39,e0_greek_lambda_b_i1,e0_A_L_i1,e0_B_L_i1,e0_C_L_i1,e0_T_b_i1,e0_T_c_i1) ;
    e0_h_l_j49_i1 = fun_47216__function(e0_T_j49,e0_C_L_i1,e0_B_L_i1,e0_A_L_i1) ;
    e0_h_v_j47_i2 =
fun_47210__function(e0_T_j47,e0_greek_lambda_b_i2,e0_A_L_i2,e0_B_L_i2,e0_C_L_i2,e0_T_b_i2,e0_T_c_i2) ;
    e0_P_o_j3_i2 = fun_47218__function(e0_T_j3,e0_C_i2,e0_B_i2,e0_A_i2) ;
    e0_P_o_j27_i1 = fun_47218__function(e0_T_j27,e0_C_i1,e0_B_i1,e0_A_i1) ;
    e0_h_l_j47_i2 = fun_47216__function(e0_T_j47,e0_C_L_i2,e0_B_L_i2,e0_A_L_i2) ;
    e0_h_l_j8_i1 = fun_47216__function(e0_T_j8,e0_C_L_i1,e0_B_L_i1,e0_A_L_i1) ;
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    e0_P_o_j5_i2 = fun_47218__function(e0_T_j5,e0_C_i2,e0_B_i2,e0_A_i2) ;
    e0_P_o_j6_i1 = fun_47218__function(e0_T_j6,e0_C_i1,e0_B_i1,e0_A_i1) ;
    e0_h_v_j10_i2 =
fun_47210__function(e0_T_j10,e0_greek_lambda_b_i2,e0_A_L_i2,e0_B_L_i2,e0_C_L_i2,e0_T_b_i2,e0_T_c_i2) ;
    e0_h_l_j16_i1 = fun_47216__function(e0_T_j16,e0_C_L_i1,e0_B_L_i1,e0_A_L_i1) ;
    e0_h_v_j29_i2 =
fun_47210__function(e0_T_j29,e0_greek_lambda_b_i2,e0_A_L_i2,e0_B_L_i2,e0_C_L_i2,e0_T_b_i2,e0_T_c_i2) ;
    e0_P_o_j1_i1 = fun_47218__function(e0_T_j1,e0_C_i1,e0_B_i1,e0_A_i1) ;
    e0_h_v_j5_i1 = fun_47210__function(e0_T_j5,e0_greek_lambda_b_i1,e0_A_L_i1,e0_B_L_i1,e0_C_L_i1,e0_T_b_i1,e0_T_c_i1)
;
    e0_h_l_j29_i2 = fun_47216__function(e0_T_j29,e0_C_L_i2,e0_B_L_i2,e0_A_L_i2) ;
    e0_h_v_j16_i1 =
fun_47210__function(e0_T_j16,e0_greek_lambda_b_i1,e0_A_L_i1,e0_B_L_i1,e0_C_L_i1,e0_T_b_i1,e0_T_c_i1) ;
    e0_h_l_j5_i1 = fun_47216__function(e0_T_j5,e0_C_L_i1,e0_B_L_i1,e0_A_L_i1) ;
    e0_h_l_j10_i2 = fun_47216__function(e0_T_j10,e0_C_L_i2,e0_B_L_i2,e0_A_L_i2) ;
    e0_h_v_j13_i1 =
fun_47210__function(e0_T_j13,e0_greek_lambda_b_i1,e0_A_L_i1,e0_B_L_i1,e0_C_L_i1,e0_T_b_i1,e0_T_c_i1) ;
    e0_h_v_j15_i2 =
fun_47210__function(e0_T_j15,e0_greek_lambda_b_i2,e0_A_L_i2,e0_B_L_i2,e0_C_L_i2,e0_T_b_i2,e0_T_c_i2) ;
    e0_h_v_j45_i2 =
fun_47210__function(e0_T_j45,e0_greek_lambda_b_i2,e0_A_L_i2,e0_B_L_i2,e0_C_L_i2,e0_T_b_i2,e0_T_c_i2) ;
    e0_h_l_j15_i2 = fun_47216__function(e0_T_j15,e0_C_L_i2,e0_B_L_i2,e0_A_L_i2) ;
    e0_P_o_j23_i2 = fun_47218__function(e0_T_j23,e0_C_i2,e0_B_i2,e0_A_i2) ;
    e0_h_l_j13_i1 = fun_47216__function(e0_T_j13,e0_C_L_i1,e0_B_L_i1,e0_A_L_i1) ;
    e0_P_o_j32_i1 = fun_47218__function(e0_T_j32,e0_C_i1,e0_B_i1,e0_A_i1) ;
    e0_P_o_j26_i2 = fun_47218__function(e0_T_j26,e0_C_i2,e0_B_i2,e0_A_i2) ;
    e0_h_l_j30_i2 = fun_47216__function(e0_T_j30,e0_C_L_i2,e0_B_L_i2,e0_A_L_i2) ;
    e0_P_o_j4_i1 = fun_47218__function(e0_T_j4,e0_C_i1,e0_B_i1,e0_A_i1) ;
    e0_h_v_j30_i2 =
fun_47210__function(e0_T_j30,e0_greek_lambda_b_i2,e0_A_L_i2,e0_B_L_i2,e0_C_L_i2,e0_T_b_i2,e0_T_c_i2) ;
    e0_h_l_j45_i2 = fun_47216__function(e0_T_j45,e0_C_L_i2,e0_B_L_i2,e0_A_L_i2) ;
    e0_P_o_j24_i1 = fun_47218__function(e0_T_j24,e0_C_i1,e0_B_i1,e0_A_i1) ;
    e0_h_l_j31_i1 = fun_47216__function(e0_T_j31,e0_C_L_i1,e0_B_L_i1,e0_A_L_i1) ;
    e0_h_v_j31_i1 =
fun_47210__function(e0_T_j31,e0_greek_lambda_b_i1,e0_A_L_i1,e0_B_L_i1,e0_C_L_i1,e0_T_b_i1,e0_T_c_i1) ;
    e0_h_l_j6_i2 = fun_47216__function(e0_T_j6,e0_C_L_i2,e0_B_L_i2,e0_A_L_i2) ;
    e0_h_v_j6_i2 = fun_47210__function(e0_T_j6,e0_greek_lambda_b_i2,e0_A_L_i2,e0_B_L_i2,e0_C_L_i2,e0_T_b_i2,e0_T_c_i2)
;
    e0_h_v_j8_i1 = fun_47210__function(e0_T_j8,e0_greek_lambda_b_i1,e0_A_L_i1,e0_B_L_i1,e0_C_L_i1,e0_T_b_i1,e0_T_c_i1)
;
    e0_P_o_j47_i1 = fun_47218__function(e0_T_j47,e0_C_i1,e0_B_i1,e0_A_i1) ;
    e0_h_v_j7_i2 = fun_47210__function(e0_T_j7,e0_greek_lambda_b_i2,e0_A_L_i2,e0_B_L_i2,e0_C_L_i2,e0_T_b_i2,e0_T_c_i2)
;
    e0_h_l_j7_i2 = fun_47216__function(e0_T_j7,e0_C_L_i2,e0_B_L_i2,e0_A_L_i2) ;
    e0_P_o_j8_i2 = fun_47218__function(e0_T_j8,e0_C_i2,e0_B_i2,e0_A_i2) ;
    e0_P_o_j46_i2 = fun_47218__function(e0_T_j46,e0_C_i2,e0_B_i2,e0_A_i2) ;
    e0_P_o_j31_i2 = fun_47218__function(e0_T_j31,e0_C_i2,e0_B_i2,e0_A_i2) ;
    e0_P_o_j9_i1 = fun_47218__function(e0_T_j9,e0_C_i1,e0_B_i1,e0_A_i1) ;
    e0_h_l_j27_i2 = fun_47216__function(e0_T_j27,e0_C_L_i2,e0_B_L_i2,e0_A_L_i2) ;
    e0_P_o_j17_i2 = fun_47218__function(e0_T_j17,e0_C_i2,e0_B_i2,e0_A_i2) ;
    e0_P_o_j43_i2 = fun_47218__function(e0_T_j43,e0_C_i2,e0_B_i2,e0_A_i2) ;
    e0_h_l_j12_i2 = fun_47216__function(e0_T_j12,e0_C_L_i2,e0_B_L_i2,e0_A_L_i2) ;
    e0_h_v_j12_i2 =
fun_47210__function(e0_T_j12,e0_greek_lambda_b_i2,e0_A_L_i2,e0_B_L_i2,e0_C_L_i2,e0_T_b_i2,e0_T_c_i2) ;
    e0_P_o_j18_i1 = fun_47218__function(e0_T_j18,e0_C_i1,e0_B_i1,e0_A_i1) ;
    e0_P_o_j15_i1 = fun_47218__function(e0_T_j15,e0_C_i1,e0_B_i1,e0_A_i1) ;
    e0_P_o_j29_i1 = fun_47218__function(e0_T_j29,e0_C_i1,e0_B_i1,e0_A_i1) ;
    e0_h_l_j1_i2 = fun_47216__function(e0_T_j1,e0_C_L_i2,e0_B_L_i2,e0_A_L_i2) ;
    e0_h_v_j28_i1 =
fun_47210__function(e0_T_j28,e0_greek_lambda_b_i1,e0_A_L_i1,e0_B_L_i1,e0_C_L_i1,e0_T_b_i1,e0_T_c_i1) ;
    e0_P_o_j40_i2 = fun_47218__function(e0_T_j40,e0_C_i2,e0_B_i2,e0_A_i2) ;
    e0_h_v_j27_i2 =
fun_47210__function(e0_T_j27,e0_greek_lambda_b_i2,e0_A_L_i2,e0_B_L_i2,e0_C_L_i2,e0_T_b_i2,e0_T_c_i2) ;
    e0_P_o_j41_i1 = fun_47218__function(e0_T_j41,e0_C_i1,e0_B_i1,e0_A_i1) ;
    e0_h_l_j28_i1 = fun_47216__function(e0_T_j28,e0_C_L_i1,e0_B_L_i1,e0_A_L_i1) ;
    e0_P_o_j14_i2 = fun_47218__function(e0_T_j14,e0_C_i2,e0_B_i2,e0_A_i2) ;
    e0_h_v_j1_i2 = fun_47210__function(e0_T_j1,e0_greek_lambda_b_i2,e0_A_L_i2,e0_B_L_i2,e0_C_L_i2,e0_T_b_i2,e0_T_c_i2)
;
    e0_P_o_j49_i2 = fun_47218__function(e0_T_j49,e0_C_i2,e0_B_i2,e0_A_i2) ;
    e0_P_o_j21_i1 = fun_47218__function(e0_T_j21,e0_C_i1,e0_B_i1,e0_A_i1) ;
    e0_h_l_j41_i2 = fun_47216__function(e0_T_j41,e0_C_L_i2,e0_B_L_i2,e0_A_L_i2) ;
    e0_h_v_j41_i2 =
fun_47210__function(e0_T_j41,e0_greek_lambda_b_i2,e0_A_L_i2,e0_B_L_i2,e0_C_L_i2,e0_T_b_i2,e0_T_c_i2) ;
    e0_h_l_j2_i1 = fun_47216__function(e0_T_j2,e0_C_L_i1,e0_B_L_i1,e0_A_L_i1) ;
    e0_h_l_j4_i2 = fun_47216__function(e0_T_j4,e0_C_L_i2,e0_B_L_i2,e0_A_L_i2) ;
    e0_P_o_j11_i2 = fun_47218__function(e0_T_j11,e0_C_i2,e0_B_i2,e0_A_i2) ;
    e0_h_v_j4_i2 = fun_47210__function(e0_T_j4,e0_greek_lambda_b_i2,e0_A_L_i2,e0_B_L_i2,e0_C_L_i2,e0_T_b_i2,e0_T_c_i2)
;
    e0_h_v_j25_i1 =
fun_47210__function(e0_T_j25,e0_greek_lambda_b_i1,e0_A_L_i1,e0_B_L_i1,e0_C_L_i1,e0_T_b_i1,e0_T_c_i1) ;
    e0_h_l_j24_i2 = fun_47216__function(e0_T_j24,e0_C_L_i2,e0_B_L_i2,e0_A_L_i2) ;
    e0_h_v_j2_i1 = fun_47210__function(e0_T_j2,e0_greek_lambda_b_i1,e0_A_L_i1,e0_B_L_i1,e0_C_L_i1,e0_T_b_i1,e0_T_c_i1)
;
    e0_h_v_j24_i2 =
fun_47210__function(e0_T_j24,e0_greek_lambda_b_i2,e0_A_L_i2,e0_B_L_i2,e0_C_L_i2,e0_T_b_i2,e0_T_c_i2) ;
    e0_P_o_j20_i2 = fun_47218__function(e0_T_j20,e0_C_i2,e0_B_i2,e0_A_i2) ;
    e0_h_l_j48_i1 = fun_47216__function(e0_T_j48,e0_C_L_i1,e0_B_L_i1,e0_A_L_i1) ;
    e0_h_l_j25_i1 = fun_47216__function(e0_T_j25,e0_C_L_i1,e0_B_L_i1,e0_A_L_i1) ;
    e0_P_o_j44_i1 = fun_47218__function(e0_T_j44,e0_C_i1,e0_B_i1,e0_A_i1) ;
    e0_h_l_j33_i2 = fun_47216__function(e0_T_j33,e0_C_L_i2,e0_B_L_i2,e0_A_L_i2) ;
    e0_P_o_j35_i1 = fun_47218__function(e0_T_j35,e0_C_i1,e0_B_i1,e0_A_i1) ;
    e0_h_v_j48_i1 =
fun_47210__function(e0_T_j48,e0_greek_lambda_b_i1,e0_A_L_i1,e0_B_L_i1,e0_C_L_i1,e0_T_b_i1,e0_T_c_i1) ;
    e0_h_v_j33_i2 =
fun_47210__function(e0_T_j33,e0_greek_lambda_b_i2,e0_A_L_i2,e0_B_L_i2,e0_C_L_i2,e0_T_b_i2,e0_T_c_i2) ;
    e0_h_v_j26_i2 =
fun_47210__function(e0_T_j26,e0_greek_lambda_b_i2,e0_A_L_i2,e0_B_L_i2,e0_C_L_i2,e0_T_b_i2,e0_T_c_i2) ;
    e0_P_o_j34_i2 = fun_47218__function(e0_T_j34,e0_C_i2,e0_B_i2,e0_A_i2) ;
    e0_h_v_j13_i2 =
fun_47210__function(e0_T_j13,e0_greek_lambda_b_i2,e0_A_L_i2,e0_B_L_i2,e0_C_L_i2,e0_T_b_i2,e0_T_c_i2) ;
    e0_h_l_j0_i2 = fun_47216__function(e0_T_j0,e0_C_L_i2,e0_B_L_i2,e0_A_L_i2) ;
    e0_h_v_j24_i1 =
fun_47210__function(e0_T_j24,e0_greek_lambda_b_i1,e0_A_L_i1,e0_B_L_i1,e0_C_L_i1,e0_T_b_i1,e0_T_c_i1) ;
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    e0_h_l_j34_i1 = fun_47216__function(e0_T_j34,e0_C_L_i1,e0_B_L_i1,e0_A_L_i1) ;
    e0_h_l_j36_i2 = fun_47216__function(e0_T_j36,e0_C_L_i2,e0_B_L_i2,e0_A_L_i2) ;
    e0_h_v_j23_i2 =
fun_47210__function(e0_T_j23,e0_greek_lambda_b_i2,e0_A_L_i2,e0_B_L_i2,e0_C_L_i2,e0_T_b_i2,e0_T_c_i2) ;
    e0_h_l_j49_i2 = fun_47216__function(e0_T_j49,e0_C_L_i2,e0_B_L_i2,e0_A_L_i2) ;
    e0_h_v_j36_i2 =
fun_47210__function(e0_T_j36,e0_greek_lambda_b_i2,e0_A_L_i2,e0_B_L_i2,e0_C_L_i2,e0_T_b_i2,e0_T_c_i2) ;
    e0_h_l_j23_i2 = fun_47216__function(e0_T_j23,e0_C_L_i2,e0_B_L_i2,e0_A_L_i2) ;
    e0_h_v_j34_i1 =
fun_47210__function(e0_T_j34,e0_greek_lambda_b_i1,e0_A_L_i1,e0_B_L_i1,e0_C_L_i1,e0_T_b_i1,e0_T_c_i1) ;
    e0_h_l_j13_i2 = fun_47216__function(e0_T_j13,e0_C_L_i2,e0_B_L_i2,e0_A_L_i2) ;
    e0_h_l_j26_i2 = fun_47216__function(e0_T_j26,e0_C_L_i2,e0_B_L_i2,e0_A_L_i2) ;
    e0_h_v_j49_i2 =
fun_47210__function(e0_T_j49,e0_greek_lambda_b_i2,e0_A_L_i2,e0_B_L_i2,e0_C_L_i2,e0_T_b_i2,e0_T_c_i2) ;
    e0_P_o_j12_i1 = fun_47218__function(e0_T_j12,e0_C_i1,e0_B_i1,e0_A_i1) ;
    e0_h_v_j3_i2 = fun_47210__function(e0_T_j3,e0_greek_lambda_b_i2,e0_A_L_i2,e0_B_L_i2,e0_C_L_i2,e0_T_b_i2,e0_T_c_i2)
;
    e0_h_l_j3_i2 = fun_47216__function(e0_T_j3,e0_C_L_i2,e0_B_L_i2,e0_A_L_i2) ;
    e0_P_o_j48_i1 = fun_47218__function(e0_T_j48,e0_C_i1,e0_B_i1,e0_A_i1) ;
    e0_h_v_j39_i2 =
fun_47210__function(e0_T_j39,e0_greek_lambda_b_i2,e0_A_L_i2,e0_B_L_i2,e0_C_L_i2,e0_T_b_i2,e0_T_c_i2) ;
    e0_h_l_j24_i1 = fun_47216__function(e0_T_j24,e0_C_L_i1,e0_B_L_i1,e0_A_L_i1) ;
    e0_h_l_j46_i2 = fun_47216__function(e0_T_j46,e0_C_L_i2,e0_B_L_i2,e0_A_L_i2) ;
    e0_h_l_j39_i2 = fun_47216__function(e0_T_j39,e0_C_L_i2,e0_B_L_i2,e0_A_L_i2) ;
    e0_h_v_j46_i2 =
fun_47210__function(e0_T_j46,e0_greek_lambda_b_i2,e0_A_L_i2,e0_B_L_i2,e0_C_L_i2,e0_T_b_i2,e0_T_c_i2) ;
    e0_h_v_j14_i1 =
fun_47210__function(e0_T_j14,e0_greek_lambda_b_i1,e0_A_L_i1,e0_B_L_i1,e0_C_L_i1,e0_T_b_i1,e0_T_c_i1) ;
    e0_P_o_j28_i1 = fun_47218__function(e0_T_j28,e0_C_i1,e0_B_i1,e0_A_i1) ;
    e0_h_l_j27_i1 = fun_47216__function(e0_T_j27,e0_C_L_i1,e0_B_L_i1,e0_A_L_i1) ;
    e0_h_v_j27_i1 =
fun_47210__function(e0_T_j27,e0_greek_lambda_b_i1,e0_A_L_i1,e0_B_L_i1,e0_C_L_i1,e0_T_b_i1,e0_T_c_i1) ;
    e0_h_l_j14_i1 = fun_47216__function(e0_T_j14,e0_C_L_i1,e0_B_L_i1,e0_A_L_i1) ;
    e0_P_o_j37_i2 = fun_47218__function(e0_T_j37,e0_C_i2,e0_B_i2,e0_A_i2) ;
    e0_P_o_j38_i1 = fun_47218__function(e0_T_j38,e0_C_i1,e0_B_i1,e0_A_i1) ;
    e0_P_o_j5_i1 = fun_47218__function(e0_T_j5,e0_C_i1,e0_B_i1,e0_A_i1) ;
    e0_h_v_j4_i1 = fun_47210__function(e0_T_j4,e0_greek_lambda_b_i1,e0_A_L_i1,e0_B_L_i1,e0_C_L_i1,e0_T_b_i1,e0_T_c_i1)
;
    e0_h_l_j16_i2 = fun_47216__function(e0_T_j16,e0_C_L_i2,e0_B_L_i2,e0_A_L_i2) ;
    e0_h_v_j16_i2 =
fun_47210__function(e0_T_j16,e0_greek_lambda_b_i2,e0_A_L_i2,e0_B_L_i2,e0_C_L_i2,e0_T_b_i2,e0_T_c_i2) ;
    e0_h_l_j4_i1 = fun_47216__function(e0_T_j4,e0_C_L_i1,e0_B_L_i1,e0_A_L_i1) ;
    e0_h_v_j37_i1 =
fun_47210__function(e0_T_j37,e0_greek_lambda_b_i1,e0_A_L_i1,e0_B_L_i1,e0_C_L_i1,e0_T_b_i1,e0_T_c_i1) ;
    e0_P_o_j27_i2 = fun_47218__function(e0_T_j27,e0_C_i2,e0_B_i2,e0_A_i2) ;
    e0_h_v_j41_i1 =
fun_47210__function(e0_T_j41,e0_greek_lambda_b_i1,e0_A_L_i1,e0_B_L_i1,e0_C_L_i1,e0_T_b_i1,e0_T_c_i1) ;
    e0_h_l_j40_i2 = fun_47216__function(e0_T_j40,e0_C_L_i2,e0_B_L_i2,e0_A_L_i2) ;
    e0_h_v_j40_i2 =
fun_47210__function(e0_T_j40,e0_greek_lambda_b_i2,e0_A_L_i2,e0_B_L_i2,e0_C_L_i2,e0_T_b_i2,e0_T_c_i2) ;
    e0_h_l_j37_i1 = fun_47216__function(e0_T_j37,e0_C_L_i1,e0_B_L_i1,e0_A_L_i1) ;
    e0_h_l_j9_i2 = fun_47216__function(e0_T_j9,e0_C_L_i2,e0_B_L_i2,e0_A_L_i2) ;
    e0_h_v_j20_i1 =
fun_47210__function(e0_T_j20,e0_greek_lambda_b_i1,e0_A_L_i1,e0_B_L_i1,e0_C_L_i1,e0_T_b_i1,e0_T_c_i1) ;
    e0_h_l_j22_i2 = fun_47216__function(e0_T_j22,e0_C_L_i2,e0_B_L_i2,e0_A_L_i2) ;
    e0_h_v_j33_i1 =
fun_47210__function(e0_T_j33,e0_greek_lambda_b_i1,e0_A_L_i1,e0_B_L_i1,e0_C_L_i1,e0_T_b_i1,e0_T_c_i1) ;
    e0_h_v_j22_i2 =
fun_47210__function(e0_T_j22,e0_greek_lambda_b_i2,e0_A_L_i2,e0_B_L_i2,e0_C_L_i2,e0_T_b_i2,e0_T_c_i2) ;
    e0_h_l_j20_i1 = fun_47216__function(e0_T_j20,e0_C_L_i1,e0_B_L_i1,e0_A_L_i1) ;
    e0_h_v_j9_i2 = fun_47210__function(e0_T_j9,e0_greek_lambda_b_i2,e0_A_L_i2,e0_B_L_i2,e0_C_L_i2,e0_T_b_i2,e0_T_c_i2)
;
    e0_h_l_j33_i1 = fun_47216__function(e0_T_j33,e0_C_L_i1,e0_B_L_i1,e0_A_L_i1) ;
    e0_h_v_j17_i1 =
fun_47210__function(e0_T_j17,e0_greek_lambda_b_i1,e0_A_L_i1,e0_B_L_i1,e0_C_L_i1,e0_T_b_i1,e0_T_c_i1) ;
    e0_h_l_j43_i1 = fun_47216__function(e0_T_j43,e0_C_L_i1,e0_B_L_i1,e0_A_L_i1) ;
    e0_h_v_j43_i1 =
fun_47210__function(e0_T_j43,e0_greek_lambda_b_i1,e0_A_L_i1,e0_B_L_i1,e0_C_L_i1,e0_T_b_i1,e0_T_c_i1) ;
    e0_P_o_j44_i2 = fun_47218__function(e0_T_j44,e0_C_i2,e0_B_i2,e0_A_i2) ;
    e0_h_l_j7_i1 = fun_47216__function(e0_T_j7,e0_C_L_i1,e0_B_L_i1,e0_A_L_i1) ;
    e0_h_v_j7_i1 = fun_47210__function(e0_T_j7,e0_greek_lambda_b_i1,e0_A_L_i1,e0_B_L_i1,e0_C_L_i1,e0_T_b_i1,e0_T_c_i1)
;
    e0_h_l_j17_i1 = fun_47216__function(e0_T_j17,e0_C_L_i1,e0_B_L_i1,e0_A_L_i1) ;
    e0_h_l_j47_i1 = fun_47216__function(e0_T_j47,e0_C_L_i1,e0_B_L_i1,e0_A_L_i1) ;
    e0_h_v_j47_i1 =
fun_47210__function(e0_T_j47,e0_greek_lambda_b_i1,e0_A_L_i1,e0_B_L_i1,e0_C_L_i1,e0_T_b_i1,e0_T_c_i1) ;
    e0_h_v_j1_i1 = fun_47210__function(e0_T_j1,e0_greek_lambda_b_i1,e0_A_L_i1,e0_B_L_i1,e0_C_L_i1,e0_T_b_i1,e0_T_c_i1)
;
    e0_h_l_j32_i2 = fun_47216__function(e0_T_j32,e0_C_L_i2,e0_B_L_i2,e0_A_L_i2) ;
    e0_h_v_j19_i2 =
fun_47210__function(e0_T_j19,e0_greek_lambda_b_i2,e0_A_L_i2,e0_B_L_i2,e0_C_L_i2,e0_T_b_i2,e0_T_c_i2) ;
    e0_h_v_j32_i2 =
fun_47210__function(e0_T_j32,e0_greek_lambda_b_i2,e0_A_L_i2,e0_B_L_i2,e0_C_L_i2,e0_T_b_i2,e0_T_c_i2) ;
    e0_h_l_j19_i2 = fun_47216__function(e0_T_j19,e0_C_L_i2,e0_B_L_i2,e0_A_L_i2) ;
    e0_P_o_j45_i1 = fun_47218__function(e0_T_j45,e0_C_i1,e0_B_i1,e0_A_i1) ;
    e0_h_l_j40_i1 = fun_47216__function(e0_T_j40,e0_C_L_i1,e0_B_L_i1,e0_A_L_i1) ;
    e0_h_l_j1_i1 = fun_47216__function(e0_T_j1,e0_C_L_i1,e0_B_L_i1,e0_A_L_i1) ;
    e0_h_v_j42_i2 =
fun_47210__function(e0_T_j42,e0_greek_lambda_b_i2,e0_A_L_i2,e0_B_L_i2,e0_C_L_i2,e0_T_b_i2,e0_T_c_i2) ;
    e0_h_l_j10_i1 = fun_47216__function(e0_T_j10,e0_C_L_i1,e0_B_L_i1,e0_A_L_i1) ;
    e0_h_v_j30_i1 =
fun_47210__function(e0_T_j30,e0_greek_lambda_b_i1,e0_A_L_i1,e0_B_L_i1,e0_C_L_i1,e0_T_b_i1,e0_T_c_i1) ;
    e0_h_v_j10_i1 =
fun_47210__function(e0_T_j10,e0_greek_lambda_b_i1,e0_A_L_i1,e0_B_L_i1,e0_C_L_i1,e0_T_b_i1,e0_T_c_i1) ;
    e0_h_l_j11_i1 = fun_47216__function(e0_T_j11,e0_C_L_i1,e0_B_L_i1,e0_A_L_i1) ;
    e0_h_v_j11_i1 =
fun_47210__function(e0_T_j11,e0_greek_lambda_b_i1,e0_A_L_i1,e0_B_L_i1,e0_C_L_i1,e0_T_b_i1,e0_T_c_i1) ;
    e0_h_l_j30_i1 = fun_47216__function(e0_T_j30,e0_C_L_i1,e0_B_L_i1,e0_A_L_i1) ;
    e0_h_l_j42_i2 = fun_47216__function(e0_T_j42,e0_C_L_i2,e0_B_L_i2,e0_A_L_i2) ;
    e0_P_o_j16_i2 = fun_47218__function(e0_T_j16,e0_C_i2,e0_B_i2,e0_A_i2) ;
    e0_h_l_j2_i2 = fun_47216__function(e0_T_j2,e0_C_L_i2,e0_B_L_i2,e0_A_L_i2) ;
    e0_h_v_j21_i1 =
fun_47210__function(e0_T_j21,e0_greek_lambda_b_i1,e0_A_L_i1,e0_B_L_i1,e0_C_L_i1,e0_T_b_i1,e0_T_c_i1) ;
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    e0_h_l_j21_i1 = fun_47216__function(e0_T_j21,e0_C_L_i1,e0_B_L_i1,e0_A_L_i1) ;
    e0_P_o_j37_i1 = fun_47218__function(e0_T_j37,e0_C_i1,e0_B_i1,e0_A_i1) ;
    e0_P_o_j13_i2 = fun_47218__function(e0_T_j13,e0_C_i2,e0_B_i2,e0_A_i2) ;
    e0_P_o_j11_i1 = fun_47218__function(e0_T_j11,e0_C_i1,e0_B_i1,e0_A_i1) ;
    e0_h_v_j40_i1 =
fun_47210__function(e0_T_j40,e0_greek_lambda_b_i1,e0_A_L_i1,e0_B_L_i1,e0_C_L_i1,e0_T_b_i1,e0_T_c_i1) ;
    e0_h_v_j34_i2 =
fun_47210__function(e0_T_j34,e0_greek_lambda_b_i2,e0_A_L_i2,e0_B_L_i2,e0_C_L_i2,e0_T_b_i2,e0_T_c_i2) ;
    e0_h_l_j20_i2 = fun_47216__function(e0_T_j20,e0_C_L_i2,e0_B_L_i2,e0_A_L_i2) ;
    e0_h_v_j20_i2 =
fun_47210__function(e0_T_j20,e0_greek_lambda_b_i2,e0_A_L_i2,e0_B_L_i2,e0_C_L_i2,e0_T_b_i2,e0_T_c_i2) ;
    e0_P_o_j21_i2 = fun_47218__function(e0_T_j21,e0_C_i2,e0_B_i2,e0_A_i2) ;
    e0_h_l_j35_i1 = fun_47216__function(e0_T_j35,e0_C_L_i1,e0_B_L_i1,e0_A_L_i1) ;
    e0_h_v_j35_i1 =
fun_47210__function(e0_T_j35,e0_greek_lambda_b_i1,e0_A_L_i1,e0_B_L_i1,e0_C_L_i1,e0_T_b_i1,e0_T_c_i1) ;
    e0_P_o_j22_i1 = fun_47218__function(e0_T_j22,e0_C_i1,e0_B_i1,e0_A_i1) ;
    e0_P_o_j36_i2 = fun_47218__function(e0_T_j36,e0_C_i2,e0_B_i2,e0_A_i2) ;
    e0_h_l_j26_i1 = fun_47216__function(e0_T_j26,e0_C_L_i1,e0_B_L_i1,e0_A_L_i1) ;
    e0_P_o_j34_i1 = fun_47218__function(e0_T_j34,e0_C_i1,e0_B_i1,e0_A_i1) ;
    e0_P_o_j35_i2 = fun_47218__function(e0_T_j35,e0_C_i2,e0_B_i2,e0_A_i2) ;
    e0_h_v_j26_i1 =
fun_47210__function(e0_T_j26,e0_greek_lambda_b_i1,e0_A_L_i1,e0_B_L_i1,e0_C_L_i1,e0_T_b_i1,e0_T_c_i1) ;
    e0_h_l_j23_i1 = fun_47216__function(e0_T_j23,e0_C_L_i1,e0_B_L_i1,e0_A_L_i1) ;
    e0_h_v_j23_i1 =
fun_47210__function(e0_T_j23,e0_greek_lambda_b_i1,e0_A_L_i1,e0_B_L_i1,e0_C_L_i1,e0_T_b_i1,e0_T_c_i1) ;
    e0_h_l_j17_i2 = fun_47216__function(e0_T_j17,e0_C_L_i2,e0_B_L_i2,e0_A_L_i2) ;
    e0_h_v_j12_i1 =
fun_47210__function(e0_T_j12,e0_greek_lambda_b_i1,e0_A_L_i1,e0_B_L_i1,e0_C_L_i1,e0_T_b_i1,e0_T_c_i1) ;
    e0_P_o_j19_i1 = fun_47218__function(e0_T_j19,e0_C_i1,e0_B_i1,e0_A_i1) ;
    e0_h_v_j11_i2 =
fun_47210__function(e0_T_j11,e0_greek_lambda_b_i2,e0_A_L_i2,e0_B_L_i2,e0_C_L_i2,e0_T_b_i2,e0_T_c_i2) ;
    e0_h_l_j12_i1 = fun_47216__function(e0_T_j12,e0_C_L_i1,e0_B_L_i1,e0_A_L_i1) ;
    e0_h_v_j17_i2 =
fun_47210__function(e0_T_j17,e0_greek_lambda_b_i2,e0_A_L_i2,e0_B_L_i2,e0_C_L_i2,e0_T_b_i2,e0_T_c_i2) ;
    e0_P_o_j18_i2 = fun_47218__function(e0_T_j18,e0_C_i2,e0_B_i2,e0_A_i2) ;
    e0_h_l_j25_i2 = fun_47216__function(e0_T_j25,e0_C_L_i2,e0_B_L_i2,e0_A_L_i2) ;
    e0_P_o_j14_i1 = fun_47218__function(e0_T_j14,e0_C_i1,e0_B_i1,e0_A_i1) ;
    e0_h_v_j25_i2 =
fun_47210__function(e0_T_j25,e0_greek_lambda_b_i2,e0_A_L_i2,e0_B_L_i2,e0_C_L_i2,e0_T_b_i2,e0_T_c_i2) ;
    e0_h_v_j2_i2 = fun_47210__function(e0_T_j2,e0_greek_lambda_b_i2,e0_A_L_i2,e0_B_L_i2,e0_C_L_i2,e0_T_b_i2,e0_T_c_i2)
;
    e0_h_l_j18_i1 = fun_47216__function(e0_T_j18,e0_C_L_i1,e0_B_L_i1,e0_A_L_i1) ;
    e0_P_o_j12_i2 = fun_47218__function(e0_T_j12,e0_C_i2,e0_B_i2,e0_A_i2) ;
    e0_P_o_j42_i1 = fun_47218__function(e0_T_j42,e0_C_i1,e0_B_i1,e0_A_i1) ;
    e0_h_v_j18_i1 =
fun_47210__function(e0_T_j18,e0_greek_lambda_b_i1,e0_A_L_i1,e0_B_L_i1,e0_C_L_i1,e0_T_b_i1,e0_T_c_i1) ;
    e0_h_l_j3_i1 = fun_47216__function(e0_T_j3,e0_C_L_i1,e0_B_L_i1,e0_A_L_i1) ;
    e0_h_v_j3_i1 = fun_47210__function(e0_T_j3,e0_greek_lambda_b_i1,e0_A_L_i1,e0_B_L_i1,e0_C_L_i1,e0_T_b_i1,e0_T_c_i1)
;
    e0_P_o_j4_i2 = fun_47218__function(e0_T_j4,e0_C_i2,e0_B_i2,e0_A_i2) ;
    e0_h_l_j15_i1 = fun_47216__function(e0_T_j15,e0_C_L_i1,e0_B_L_i1,e0_A_L_i1) ;
    e0_P_o_j2_i1 = fun_47218__function(e0_T_j2,e0_C_i1,e0_B_i1,e0_A_i1) ;
    e0_h_v_j15_i1 =
fun_47210__function(e0_T_j15,e0_greek_lambda_b_i1,e0_A_L_i1,e0_B_L_i1,e0_C_L_i1,e0_T_b_i1,e0_T_c_i1) ;
    e0_h_l_j41_i1 = fun_47216__function(e0_T_j41,e0_C_L_i1,e0_B_L_i1,e0_A_L_i1) ;
    e0_P_o_j31_i1 = fun_47218__function(e0_T_j31,e0_C_i1,e0_B_i1,e0_A_i1) ;
    e0_P_o_j41_i2 = fun_47218__function(e0_T_j41,e0_C_i2,e0_B_i2,e0_A_i2) ;
    e0_h_v_j44_i1 =
fun_47210__function(e0_T_j44,e0_greek_lambda_b_i1,e0_A_L_i1,e0_B_L_i1,e0_C_L_i1,e0_T_b_i1,e0_T_c_i1) ;
    e0_h_v_j43_i2 =
fun_47210__function(e0_T_j43,e0_greek_lambda_b_i2,e0_A_L_i2,e0_B_L_i2,e0_C_L_i2,e0_T_b_i2,e0_T_c_i2) ;
    e0_P_o_j30_i2 = fun_47218__function(e0_T_j30,e0_C_i2,e0_B_i2,e0_A_i2) ;
    e0_h_l_j44_i1 = fun_47216__function(e0_T_j44,e0_C_L_i1,e0_B_L_i1,e0_A_L_i1) ;
    e0_h_l_j11_i2 = fun_47216__function(e0_T_j11,e0_C_L_i2,e0_B_L_i2,e0_A_L_i2) ;
    e0_P_o_j33_i2 = fun_47218__function(e0_T_j33,e0_C_i2,e0_B_i2,e0_A_i2) ;
    e0_h_l_j38_i1 = fun_47216__function(e0_T_j38,e0_C_L_i1,e0_B_L_i1,e0_A_L_i1) ;
    e0_h_l_j37_i2 = fun_47216__function(e0_T_j37,e0_C_L_i2,e0_B_L_i2,e0_A_L_i2) ;
    e0_P_o_j7_i2 = fun_47218__function(e0_T_j7,e0_C_i2,e0_B_i2,e0_A_i2) ;
    e0_P_o_j8_i1 = fun_47218__function(e0_T_j8,e0_C_i1,e0_B_i1,e0_A_i1) ;
    e0_h_l_j0_i1 = fun_47216__function(e0_T_j0,e0_C_L_i1,e0_B_L_i1,e0_A_L_i1) ;
    e0_h_l_j34_i2 = fun_47216__function(e0_T_j34,e0_C_L_i2,e0_B_L_i2,e0_A_L_i2) ;
    e0_h_v_j38_i1 =
fun_47210__function(e0_T_j38,e0_greek_lambda_b_i1,e0_A_L_i1,e0_B_L_i1,e0_C_L_i1,e0_T_b_i1,e0_T_c_i1) ;
    e0_h_v_j37_i2 =
fun_47210__function(e0_T_j37,e0_greek_lambda_b_i2,e0_A_L_i2,e0_B_L_i2,e0_C_L_i2,e0_T_b_i2,e0_T_c_i2) ;
    e0_P_o_j24_i2 = fun_47218__function(e0_T_j24,e0_C_i2,e0_B_i2,e0_A_i2) ;
    e0_P_o_j25_i1 = fun_47218__function(e0_T_j25,e0_C_i1,e0_B_i1,e0_A_i1) ;
    e0_P_o_j47_i2 = fun_47218__function(e0_T_j47,e0_C_i2,e0_B_i2,e0_A_i2) ;
    e0_h_l_j43_i2 = fun_47216__function(e0_T_j43,e0_C_L_i2,e0_B_L_i2,e0_A_L_i2) ;
    e0_P_o_j1_i2 = fun_47218__function(e0_T_j1,e0_C_i2,e0_B_i2,e0_A_i2) ;
    e0_h_v_j29_i1 =
fun_47210__function(e0_T_j29,e0_greek_lambda_b_i1,e0_A_L_i1,e0_B_L_i1,e0_C_L_i1,e0_T_b_i1,e0_T_c_i1) ;
    e0_h_l_j6_i1 = fun_47216__function(e0_T_j6,e0_C_L_i1,e0_B_L_i1,e0_A_L_i1) ;
    e0_h_l_j5_i2 = fun_47216__function(e0_T_j5,e0_C_L_i2,e0_B_L_i2,e0_A_L_i2) ;
    e0_P_o_j39_i2 = fun_47218__function(e0_T_j39,e0_C_i2,e0_B_i2,e0_A_i2) ;
    e0_h_l_j29_i1 = fun_47216__function(e0_T_j29,e0_C_L_i1,e0_B_L_i1,e0_A_L_i1) ;
    e0_P_o_j10_i2 = fun_47218__function(e0_T_j10,e0_C_i2,e0_B_i2,e0_A_i2) ;
    e0_h_l_j14_i2 = fun_47216__function(e0_T_j14,e0_C_L_i2,e0_B_L_i2,e0_A_L_i2) ;
    e0_h_v_j14_i2 =
fun_47210__function(e0_T_j14,e0_greek_lambda_b_i2,e0_A_L_i2,e0_B_L_i2,e0_C_L_i2,e0_T_b_i2,e0_T_c_i2) ;
    e0_h_V_j43 = fun_47202__function(e0_h_v_j43_i1,e0_h_v_j43_i2,e0_y_j43_i1,e0_y_j43_i2) ;
    e0_K_j47_i1 = fun_47167__function(e0_greek_gamma_j47_i1,e0_P_o_j47_i1,e0_P,e0_greek_phi) ;
    e0_h_L_j43 = fun_47217__function(e0_h_l_j43_i1,e0_h_l_j43_i2,e0_x_j43_i1,e0_x_j43_i2) ;
    e0_h_L_j17 = fun_47217__function(e0_h_l_j17_i1,e0_h_l_j17_i2,e0_x_j17_i1,e0_x_j17_i2) ;
    e0_h_L_j30 = fun_47217__function(e0_h_l_j30_i1,e0_h_l_j30_i2,e0_x_j30_i1,e0_x_j30_i2) ;
    e0_h_V_j17 = fun_47202__function(e0_h_v_j17_i1,e0_h_v_j17_i2,e0_y_j17_i1,e0_y_j17_i2) ;
    e0_h_V_j30 = fun_47202__function(e0_h_v_j30_i1,e0_h_v_j30_i2,e0_y_j30_i1,e0_y_j30_i2) ;
    e0_K_j7_i1 = fun_47167__function(e0_greek_gamma_j7_i1,e0_P_o_j7_i1,e0_P,e0_greek_phi) ;
    e0_h_V_j40 = fun_47202__function(e0_h_v_j40_i1,e0_h_v_j40_i2,e0_y_j40_i1,e0_y_j40_i2) ;
    e0_K_j46_i2 = fun_47167__function(e0_greek_gamma_j46_i2,e0_P_o_j46_i2,e0_P,e0_greek_phi) ;
    e0_h_V_j33 = fun_47202__function(e0_h_v_j33_i1,e0_h_v_j33_i2,e0_y_j33_i1,e0_y_j33_i2) ;
    e0_h_L_j33 = fun_47217__function(e0_h_l_j33_i1,e0_h_l_j33_i2,e0_x_j33_i1,e0_x_j33_i2) ;
    e0_h_L_j40 = fun_47217__function(e0_h_l_j40_i1,e0_h_l_j40_i2,e0_x_j40_i1,e0_x_j40_i2) ;
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e0_K_j9_i2 = fun_47167__function(e0_greek_gamma_j9_i2,e0_P_o_j9_i2,e0_P,e0_greek_phi) ;
e0_h_L_j7 = fun_47217__function(e0_h_l_j7_i1,e0_h_l_j7_i2,e0_x_j7_i1,e0_x_j7_i2) ;
e0_h_V_j7 = fun_47202__function(e0_h_v_j7_i1,e0_h_v_j7_i2,e0_y_j7_i1,e0_y_j7_i2) ;
e0_K_j20_i1 = fun_47167__function(e0_greek_gamma_j20_i1,e0_P_o_j20_i1,e0_P,e0_greek_phi) ;
e0_K_j22_i2 = fun_47167__function(e0_greek_gamma_j22_i2,e0_P_o_j22_i2,e0_P,e0_greek_phi) ;
e0_K_j23_i2 = fun_47167__function(e0_greek_gamma_j23_i2,e0_P_o_j23_i2,e0_P,e0_greek_phi) ;
e0_K_j13_i2 = fun_47167__function(e0_greek_gamma_j13_i2,e0_P_o_j13_i2,e0_P,e0_greek_phi) ;
e0_K_j34_i1 = fun_47167__function(e0_greek_gamma_j34_i1,e0_P_o_j34_i1,e0_P,e0_greek_phi) ;
e0_K_j30_i1 = fun_47167__function(e0_greek_gamma_j30_i1,e0_P_o_j30_i1,e0_P,e0_greek_phi) ;
e0_K_j10_i1 = fun_47167__function(e0_greek_gamma_j10_i1,e0_P_o_j10_i1,e0_P,e0_greek_phi) ;
e0_h_L_j3 = fun_47217__function(e0_h_l_j3_i1,e0_h_l_j3_i2,e0_x_j3_i1,e0_x_j3_i2) ;
e0_K_j11_i1 = fun_47167__function(e0_greek_gamma_j11_i1,e0_P_o_j11_i1,e0_P,e0_greek_phi) ;
e0_h_L_j39 = fun_47217__function(e0_h_l_j39_i1,e0_h_l_j39_i2,e0_x_j39_i1,e0_x_j39_i2) ;
e0_K_j14_i1 = fun_47167__function(e0_greek_gamma_j14_i1,e0_P_o_j14_i1,e0_P,e0_greek_phi) ;
e0_h_V_j39 = fun_47202__function(e0_h_v_j39_i1,e0_h_v_j39_i2,e0_y_j39_i1,e0_y_j39_i2) ;
e0_h_V_j16 = fun_47202__function(e0_h_v_j16_i1,e0_h_v_j16_i2,e0_y_j16_i1,e0_y_j16_i2) ;
e0_K_j1_i1 = fun_47167__function(e0_greek_gamma_j1_i1,e0_P_o_j1_i1,e0_P,e0_greek_phi) ;
e0_K_j27_i1 = fun_47167__function(e0_greek_gamma_j27_i1,e0_P_o_j27_i1,e0_P,e0_greek_phi) ;
e0_K_j32_i2 = fun_47167__function(e0_greek_gamma_j32_i2,e0_P_o_j32_i2,e0_P,e0_greek_phi) ;
e0_h_L_j47 = fun_47217__function(e0_h_l_j47_i1,e0_h_l_j47_i2,e0_x_j47_i1,e0_x_j47_i2) ;
e0_h_V_j47 = fun_47202__function(e0_h_v_j47_i1,e0_h_v_j47_i2,e0_y_j47_i1,e0_y_j47_i2) ;
e0_K_j45_i2 = fun_47167__function(e0_greek_gamma_j45_i2,e0_P_o_j45_i2,e0_P,e0_greek_phi) ;
e0_h_L_j26 = fun_47217__function(e0_h_l_j26_i1,e0_h_l_j26_i2,e0_x_j26_i1,e0_x_j26_i2) ;
e0_K_j3_i2 = fun_47167__function(e0_greek_gamma_j3_i2,e0_P_o_j3_i2,e0_P,e0_greek_phi) ;
e0_K_j43_i1 = fun_47167__function(e0_greek_gamma_j43_i1,e0_P_o_j43_i1,e0_P,e0_greek_phi) ;
e0_h_L_j16 = fun_47217__function(e0_h_l_j16_i1,e0_h_l_j16_i2,e0_x_j16_i1,e0_x_j16_i2) ;
e0_K_j24_i1 = fun_47167__function(e0_greek_gamma_j24_i1,e0_P_o_j24_i1,e0_P,e0_greek_phi) ;
e0_K_j39_i2 = fun_47167__function(e0_greek_gamma_j39_i2,e0_P_o_j39_i2,e0_P,e0_greek_phi) ;
e0_h_L_j24 = fun_47217__function(e0_h_l_j24_i1,e0_h_l_j24_i2,e0_x_j24_i1,e0_x_j24_i2) ;
e0_h_V_j11 = fun_47202__function(e0_h_v_j11_i1,e0_h_v_j11_i2,e0_y_j11_i1,e0_y_j11_i2) ;
e0_K_j26_i2 = fun_47167__function(e0_greek_gamma_j26_i2,e0_P_o_j26_i2,e0_P,e0_greek_phi) ;
e0_h_V_j10 = fun_47202__function(e0_h_v_j10_i1,e0_h_v_j10_i2,e0_y_j10_i1,e0_y_j10_i2) ;
e0_K_j33_i1 = fun_47167__function(e0_greek_gamma_j33_i1,e0_P_o_j33_i1,e0_P,e0_greek_phi) ;
e0_K_j49_i2 = fun_47167__function(e0_greek_gamma_j49_i2,e0_P_o_j49_i2,e0_P,e0_greek_phi) ;
e0_K_j36_i2 = fun_47167__function(e0_greek_gamma_j36_i2,e0_P_o_j36_i2,e0_P,e0_greek_phi) ;
e0_h_V_j24 = fun_47202__function(e0_h_v_j24_i1,e0_h_v_j24_i2,e0_y_j24_i1,e0_y_j24_i2) ;
e0_h_V_j49 = fun_47202__function(e0_h_v_j49_i1,e0_h_v_j49_i2,e0_y_j49_i1,e0_y_j49_i2) ;
e0_h_L_j49 = fun_47217__function(e0_h_l_j49_i1,e0_h_l_j49_i2,e0_x_j49_i1,e0_x_j49_i2) ;
e0_h_L_j11 = fun_47217__function(e0_h_l_j11_i1,e0_h_l_j11_i2,e0_x_j11_i1,e0_x_j11_i2) ;
e0_h_L_j34 = fun_47217__function(e0_h_l_j34_i1,e0_h_l_j34_i2,e0_x_j34_i1,e0_x_j34_i2) ;
e0_K_j31_i1 = fun_47167__function(e0_greek_gamma_j31_i1,e0_P_o_j31_i1,e0_P,e0_greek_phi) ;
e0_K_j4_i1 = fun_47167__function(e0_greek_gamma_j4_i1,e0_P_o_j4_i1,e0_P,e0_greek_phi) ;
e0_K_j16_i2 = fun_47167__function(e0_greek_gamma_j16_i2,e0_P_o_j16_i2,e0_P,e0_greek_phi) ;
e0_h_V_j20 = fun_47202__function(e0_h_v_j20_i1,e0_h_v_j20_i2,e0_y_j20_i1,e0_y_j20_i2) ;
e0_K_j37_i1 = fun_47167__function(e0_greek_gamma_j37_i1,e0_P_o_j37_i1,e0_P,e0_greek_phi) ;
e0_h_V_j34 = fun_47202__function(e0_h_v_j34_i1,e0_h_v_j34_i2,e0_y_j34_i1,e0_y_j34_i2) ;
e0_h_L_j20 = fun_47217__function(e0_h_l_j20_i1,e0_h_l_j20_i2,e0_x_j20_i1,e0_x_j20_i2) ;
e0_h_L_j1 = fun_47217__function(e0_h_l_j1_i1,e0_h_l_j1_i2,e0_x_j1_i1,e0_x_j1_i2) ;
e0_K_j41_i1 = fun_47167__function(e0_greek_gamma_j41_i1,e0_P_o_j41_i1,e0_P,e0_greek_phi) ;
e0_h_L_j10 = fun_47217__function(e0_h_l_j10_i1,e0_h_l_j10_i2,e0_x_j10_i1,e0_x_j10_i2) ;
e0_h_V_j1 = fun_47202__function(e0_h_v_j1_i1,e0_h_v_j1_i2,e0_y_j1_i1,e0_y_j1_i2) ;
e0_K_j40_i2 = fun_47167__function(e0_greek_gamma_j40_i2,e0_P_o_j40_i2,e0_P,e0_greek_phi) ;
e0_K_j28_i2 = fun_47167__function(e0_greek_gamma_j28_i2,e0_P_o_j28_i2,e0_P,e0_greek_phi) ;
e0_K_j26_i1 = fun_47167__function(e0_greek_gamma_j26_i1,e0_P_o_j26_i1,e0_P,e0_greek_phi) ;
e0_h_V_j4 = fun_47202__function(e0_h_v_j4_i1,e0_h_v_j4_i2,e0_y_j4_i1,e0_y_j4_i2) ;
e0_K_j23_i1 = fun_47167__function(e0_greek_gamma_j23_i1,e0_P_o_j23_i1,e0_P,e0_greek_phi) ;
e0_h_L_j4 = fun_47217__function(e0_h_l_j4_i1,e0_h_l_j4_i2,e0_x_j4_i1,e0_x_j4_i2) ;
e0_h_L_j9 = fun_47217__function(e0_h_l_j9_i1,e0_h_l_j9_i2,e0_x_j9_i1,e0_x_j9_i2) ;
e0_h_V_j9 = fun_47202__function(e0_h_v_j9_i1,e0_h_v_j9_i2,e0_y_j9_i1,e0_y_j9_i2) ;
e0_K_j5_i1 = fun_47167__function(e0_greek_gamma_j5_i1,e0_P_o_j5_i1,e0_P,e0_greek_phi) ;
e0_K_j20_i2 = fun_47167__function(e0_greek_gamma_j20_i2,e0_P_o_j20_i2,e0_P,e0_greek_phi) ;
e0_h_L_j32 = fun_47217__function(e0_h_l_j32_i1,e0_h_l_j32_i2,e0_x_j32_i1,e0_x_j32_i2) ;
e0_K_j21_i1 = fun_47167__function(e0_greek_gamma_j21_i1,e0_P_o_j21_i1,e0_P,e0_greek_phi) ;
e0_K_j44_i1 = fun_47167__function(e0_greek_gamma_j44_i1,e0_P_o_j44_i1,e0_P,e0_greek_phi) ;
e0_K_j43_i2 = fun_47167__function(e0_greek_gamma_j43_i2,e0_P_o_j43_i2,e0_P,e0_greek_phi) ;
e0_h_V_j27 = fun_47202__function(e0_h_v_j27_i1,e0_h_v_j27_i2,e0_y_j27_i1,e0_y_j27_i2) ;
e0_K_j42_i2 = fun_47167__function(e0_greek_gamma_j42_i2,e0_P_o_j42_i2,e0_P,e0_greek_phi) ;
e0_h_V_j26 = fun_47202__function(e0_h_v_j26_i1,e0_h_v_j26_i2,e0_y_j26_i1,e0_y_j26_i2) ;
e0_K_j49_i1 = fun_47167__function(e0_greek_gamma_j49_i1,e0_P_o_j49_i1,e0_P,e0_greek_phi) ;
e0_h_V_j41 = fun_47202__function(e0_h_v_j41_i1,e0_h_v_j41_i2,e0_y_j41_i1,e0_y_j41_i2) ;
e0_h_L_j41 = fun_47217__function(e0_h_l_j41_i1,e0_h_l_j41_i2,e0_x_j41_i1,e0_x_j41_i2) ;
e0_h_L_j27 = fun_47217__function(e0_h_l_j27_i1,e0_h_l_j27_i2,e0_x_j27_i1,e0_x_j27_i2) ;
e0_h_L_j46 = fun_47217__function(e0_h_l_j46_i1,e0_h_l_j46_i2,e0_x_j46_i1,e0_x_j46_i2) ;
e0_h_V_j46 = fun_47202__function(e0_h_v_j46_i1,e0_h_v_j46_i2,e0_y_j46_i1,e0_y_j46_i2) ;
e0_K_j19_i2 = fun_47167__function(e0_greek_gamma_j19_i2,e0_P_o_j19_i2,e0_P,e0_greek_phi) ;
e0_h_L_j0 = fun_47217__function(e0_h_l_j0_i1,e0_h_l_j0_i2,e0_x_j0_i1,e0_x_j0_i2) ;
e0_h_V_j3 = fun_47202__function(e0_h_v_j3_i1,e0_h_v_j3_i2,e0_y_j3_i1,e0_y_j3_i2) ;
e0_K_j40_i1 = fun_47167__function(e0_greek_gamma_j40_i1,e0_P_o_j40_i1,e0_P,e0_greek_phi) ;
e0_K_j38_i1 = fun_47167__function(e0_greek_gamma_j38_i1,e0_P_o_j38_i1,e0_P,e0_greek_phi) ;
e0_h_L_j21 = fun_47217__function(e0_h_l_j21_i1,e0_h_l_j21_i2,e0_x_j21_i1,e0_x_j21_i2) ;
e0_h_V_j21 = fun_47202__function(e0_h_v_j21_i1,e0_h_v_j21_i2,e0_y_j21_i1,e0_y_j21_i2) ;
e0_h_L_j23 = fun_47217__function(e0_h_l_j23_i1,e0_h_l_j23_i2,e0_x_j23_i1,e0_x_j23_i2) ;
e0_h_V_j23 = fun_47202__function(e0_h_v_j23_i1,e0_h_v_j23_i2,e0_y_j23_i1,e0_y_j23_i2) ;
e0_K_j37_i2 = fun_47167__function(e0_greek_gamma_j37_i2,e0_P_o_j37_i2,e0_P,e0_greek_phi) ;
e0_h_V_j32 = fun_47202__function(e0_h_v_j32_i1,e0_h_v_j32_i2,e0_y_j32_i1,e0_y_j32_i2) ;
e0_K_j17_i1 = fun_47167__function(e0_greek_gamma_j17_i1,e0_P_o_j17_i1,e0_P,e0_greek_phi) ;
e0_K_j48_i2 = fun_47167__function(e0_greek_gamma_j48_i2,e0_P_o_j48_i2,e0_P,e0_greek_phi) ;
e0_h_L_j44 = fun_47217__function(e0_h_l_j44_i1,e0_h_l_j44_i2,e0_x_j44_i1,e0_x_j44_i2) ;
e0_K_j9_i1 = fun_47167__function(e0_greek_gamma_j9_i1,e0_P_o_j9_i1,e0_P,e0_greek_phi) ;
e0_K_j8_i2 = fun_47167__function(e0_greek_gamma_j8_i2,e0_P_o_j8_i2,e0_P,e0_greek_phi) ;
e0_K_j32_i1 = fun_47167__function(e0_greek_gamma_j32_i1,e0_P_o_j32_i1,e0_P,e0_greek_phi) ;
e0_h_V_j44 = fun_47202__function(e0_h_v_j44_i1,e0_h_v_j44_i2,e0_y_j44_i1,e0_y_j44_i2) ;
e0_h_L_j6 = fun_47217__function(e0_h_l_j6_i1,e0_h_l_j6_i2,e0_x_j6_i1,e0_x_j6_i2) ;
e0_K_j46_i1 = fun_47167__function(e0_greek_gamma_j46_i1,e0_P_o_j46_i1,e0_P,e0_greek_phi) ;
e0_h_V_j6 = fun_47202__function(e0_h_v_j6_i1,e0_h_v_j6_i2,e0_y_j6_i1,e0_y_j6_i2) ;
e0_h_L_j15 = fun_47217__function(e0_h_l_j15_i1,e0_h_l_j15_i2,e0_x_j15_i1,e0_x_j15_i2) ;
e0_h_V_j15 = fun_47202__function(e0_h_v_j15_i1,e0_h_v_j15_i2,e0_y_j15_i1,e0_y_j15_i2) ;
e0_K_j25_i2 = fun_47167__function(e0_greek_gamma_j25_i2,e0_P_o_j25_i2,e0_P,e0_greek_phi) ;
e0_K_j2_i2 = fun_47167__function(e0_greek_gamma_j2_i2,e0_P_o_j2_i2,e0_P,e0_greek_phi) ;
e0_h_V_j29 = fun_47202__function(e0_h_v_j29_i1,e0_h_v_j29_i2,e0_y_j29_i1,e0_y_j29_i2) ;
e0_h_L_j29 = fun_47217__function(e0_h_l_j29_i1,e0_h_l_j29_i2,e0_x_j29_i1,e0_x_j29_i2) ;
e0_K_j3_i1 = fun_47167__function(e0_greek_gamma_j3_i1,e0_P_o_j3_i1,e0_P,e0_greek_phi) ;
e0_K_j41_i2 = fun_47167__function(e0_greek_gamma_j41_i2,e0_P_o_j41_i2,e0_P,e0_greek_phi) ;
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e0_h_V_j12 = fun_47202__function(e0_h_v_j12_i1,e0_h_v_j12_i2,e0_y_j12_i1,e0_y_j12_i2) ;
e0_h_L_j12 = fun_47217__function(e0_h_l_j12_i1,e0_h_l_j12_i2,e0_x_j12_i1,e0_x_j12_i2) ;
e0_h_L_j25 = fun_47217__function(e0_h_l_j25_i1,e0_h_l_j25_i2,e0_x_j25_i1,e0_x_j25_i2) ;
e0_h_L_j38 = fun_47217__function(e0_h_l_j38_i1,e0_h_l_j38_i2,e0_x_j38_i1,e0_x_j38_i2) ;
e0_h_V_j25 = fun_47202__function(e0_h_v_j25_i1,e0_h_v_j25_i2,e0_y_j25_i1,e0_y_j25_i2) ;
e0_h_V_j38 = fun_47202__function(e0_h_v_j38_i1,e0_h_v_j38_i2,e0_y_j38_i1,e0_y_j38_i2) ;
e0_K_j4_i2 = fun_47167__function(e0_greek_gamma_j4_i2,e0_P_o_j4_i2,e0_P,e0_greek_phi) ;
e0_K_j2_i1 = fun_47167__function(e0_greek_gamma_j2_i1,e0_P_o_j2_i1,e0_P,e0_greek_phi) ;
e0_h_V_j28 = fun_47202__function(e0_h_v_j28_i1,e0_h_v_j28_i2,e0_y_j28_i1,e0_y_j28_i2) ;
e0_K_j31_i2 = fun_47167__function(e0_greek_gamma_j31_i2,e0_P_o_j31_i2,e0_P,e0_greek_phi) ;
e0_h_L_j35 = fun_47217__function(e0_h_l_j35_i1,e0_h_l_j35_i2,e0_x_j35_i1,e0_x_j35_i2) ;
e0_K_j42_i1 = fun_47167__function(e0_greek_gamma_j42_i1,e0_P_o_j42_i1,e0_P,e0_greek_phi) ;
e0_K_j1_i2 = fun_47167__function(e0_greek_gamma_j1_i2,e0_P_o_j1_i2,e0_P,e0_greek_phi) ;
e0_K_j15_i1 = fun_47167__function(e0_greek_gamma_j15_i1,e0_P_o_j15_i1,e0_P,e0_greek_phi) ;
e0_h_V_j35 = fun_47202__function(e0_h_v_j35_i1,e0_h_v_j35_i2,e0_y_j35_i1,e0_y_j35_i2) ;
e0_K_j18_i2 = fun_47167__function(e0_greek_gamma_j18_i2,e0_P_o_j18_i2,e0_P,e0_greek_phi) ;
e0_K_j6_i1 = fun_47167__function(e0_greek_gamma_j6_i1,e0_P_o_j6_i1,e0_P,e0_greek_phi) ;
e0_K_j19_i1 = fun_47167__function(e0_greek_gamma_j19_i1,e0_P_o_j19_i1,e0_P,e0_greek_phi) ;
e0_h_L_j8 = fun_47217__function(e0_h_l_j8_i1,e0_h_l_j8_i2,e0_x_j8_i1,e0_x_j8_i2) ;
e0_K_j29_i1 = fun_47167__function(e0_greek_gamma_j29_i1,e0_P_o_j29_i1,e0_P,e0_greek_phi) ;
e0_K_j5_i2 = fun_47167__function(e0_greek_gamma_j5_i2,e0_P_o_j5_i2,e0_P,e0_greek_phi) ;
e0_h_V_j8 = fun_47202__function(e0_h_v_j8_i1,e0_h_v_j8_i2,e0_y_j8_i1,e0_y_j8_i2) ;
e0_K_j14_i2 = fun_47167__function(e0_greek_gamma_j14_i2,e0_P_o_j14_i2,e0_P,e0_greek_phi) ;
e0_h_L_j5 = fun_47217__function(e0_h_l_j5_i1,e0_h_l_j5_i2,e0_x_j5_i1,e0_x_j5_i2) ;
e0_h_V_j5 = fun_47202__function(e0_h_v_j5_i1,e0_h_v_j5_i2,e0_y_j5_i1,e0_y_j5_i2) ;
e0_h_L_j18 = fun_47217__function(e0_h_l_j18_i1,e0_h_l_j18_i2,e0_x_j18_i1,e0_x_j18_i2) ;
e0_h_V_j18 = fun_47202__function(e0_h_v_j18_i1,e0_h_v_j18_i2,e0_y_j18_i1,e0_y_j18_i2) ;
e0_K_j12_i1 = fun_47167__function(e0_greek_gamma_j12_i1,e0_P_o_j12_i1,e0_P,e0_greek_phi) ;
e0_K_j25_i1 = fun_47167__function(e0_greek_gamma_j25_i1,e0_P_o_j25_i1,e0_P,e0_greek_phi) ;
e0_K_j11_i2 = fun_47167__function(e0_greek_gamma_j11_i2,e0_P_o_j11_i2,e0_P,e0_greek_phi) ;
e0_K_j24_i2 = fun_47167__function(e0_greek_gamma_j24_i2,e0_P_o_j24_i2,e0_P,e0_greek_phi) ;
e0_K_j34_i2 = fun_47167__function(e0_greek_gamma_j34_i2,e0_P_o_j34_i2,e0_P,e0_greek_phi) ;
e0_K_j35_i1 = fun_47167__function(e0_greek_gamma_j35_i1,e0_P_o_j35_i1,e0_P,e0_greek_phi) ;
e0_K_j8_i1 = fun_47167__function(e0_greek_gamma_j8_i1,e0_P_o_j8_i1,e0_P,e0_greek_phi) ;
e0_K_j7_i2 = fun_47167__function(e0_greek_gamma_j7_i2,e0_P_o_j7_i2,e0_P,e0_greek_phi) ;
e0_K_j18_i1 = fun_47167__function(e0_greek_gamma_j18_i1,e0_P_o_j18_i1,e0_P,e0_greek_phi) ;
e0_K_j13_i1 = fun_47167__function(e0_greek_gamma_j13_i1,e0_P_o_j13_i1,e0_P,e0_greek_phi) ;
e0_K_j15_i2 = fun_47167__function(e0_greek_gamma_j15_i2,e0_P_o_j15_i2,e0_P,e0_greek_phi) ;
e0_K_j17_i2 = fun_47167__function(e0_greek_gamma_j17_i2,e0_P_o_j17_i2,e0_P,e0_greek_phi) ;
e0_K_j30_i2 = fun_47167__function(e0_greek_gamma_j30_i2,e0_P_o_j30_i2,e0_P,e0_greek_phi) ;
e0_K_j16_i1 = fun_47167__function(e0_greek_gamma_j16_i1,e0_P_o_j16_i1,e0_P,e0_greek_phi) ;
e0_K_j10_i2 = fun_47167__function(e0_greek_gamma_j10_i2,e0_P_o_j10_i2,e0_P,e0_greek_phi) ;
e0_K_j12_i2 = fun_47167__function(e0_greek_gamma_j12_i2,e0_P_o_j12_i2,e0_P,e0_greek_phi) ;
e0_K_j36_i1 = fun_47167__function(e0_greek_gamma_j36_i1,e0_P_o_j36_i1,e0_P,e0_greek_phi) ;
e0_K_j38_i2 = fun_47167__function(e0_greek_gamma_j38_i2,e0_P_o_j38_i2,e0_P,e0_greek_phi) ;
e0_h_L_j14 = fun_47217__function(e0_h_l_j14_i1,e0_h_l_j14_i2,e0_x_j14_i1,e0_x_j14_i2) ;
e0_h_V_j14 = fun_47202__function(e0_h_v_j14_i1,e0_h_v_j14_i2,e0_y_j14_i1,e0_y_j14_i2) ;
e0_h_V_j37 = fun_47202__function(e0_h_v_j37_i1,e0_h_v_j37_i2,e0_y_j37_i1,e0_y_j37_i2) ;
e0_h_L_j37 = fun_47217__function(e0_h_l_j37_i1,e0_h_l_j37_i2,e0_x_j37_i1,e0_x_j37_i2) ;
e0_K_j47_i2 = fun_47167__function(e0_greek_gamma_j47_i2,e0_P_o_j47_i2,e0_P,e0_greek_phi) ;
e0_h_V_j36 = fun_47202__function(e0_h_v_j36_i1,e0_h_v_j36_i2,e0_y_j36_i1,e0_y_j36_i2) ;
e0_h_V_j45 = fun_47202__function(e0_h_v_j45_i1,e0_h_v_j45_i2,e0_y_j45_i1,e0_y_j45_i2) ;
e0_h_L_j45 = fun_47217__function(e0_h_l_j45_i1,e0_h_l_j45_i2,e0_x_j45_i1,e0_x_j45_i2) ;
e0_K_j48_i1 = fun_47167__function(e0_greek_gamma_j48_i1,e0_P_o_j48_i1,e0_P,e0_greek_phi) ;
e0_h_L_j22 = fun_47217__function(e0_h_l_j22_i1,e0_h_l_j22_i2,e0_x_j22_i1,e0_x_j22_i2) ;
e0_h_L_j36 = fun_47217__function(e0_h_l_j36_i1,e0_h_l_j36_i2,e0_x_j36_i1,e0_x_j36_i2) ;
e0_h_V_j22 = fun_47202__function(e0_h_v_j22_i1,e0_h_v_j22_i2,e0_y_j22_i1,e0_y_j22_i2) ;
e0_h_L_j31 = fun_47217__function(e0_h_l_j31_i1,e0_h_l_j31_i2,e0_x_j31_i1,e0_x_j31_i2) ;
e0_K_j33_i2 = fun_47167__function(e0_greek_gamma_j33_i2,e0_P_o_j33_i2,e0_P,e0_greek_phi) ;
e0_K_j39_i1 = fun_47167__function(e0_greek_gamma_j39_i1,e0_P_o_j39_i1,e0_P,e0_greek_phi) ;
e0_h_V_j31 = fun_47202__function(e0_h_v_j31_i1,e0_h_v_j31_i2,e0_y_j31_i1,e0_y_j31_i2) ;
e0_h_V_j42 = fun_47202__function(e0_h_v_j42_i1,e0_h_v_j42_i2,e0_y_j42_i1,e0_y_j42_i2) ;
e0_K_j21_i2 = fun_47167__function(e0_greek_gamma_j21_i2,e0_P_o_j21_i2,e0_P,e0_greek_phi) ;
e0_h_L_j13 = fun_47217__function(e0_h_l_j13_i1,e0_h_l_j13_i2,e0_x_j13_i1,e0_x_j13_i2) ;
e0_h_V_j13 = fun_47202__function(e0_h_v_j13_i1,e0_h_v_j13_i2,e0_y_j13_i1,e0_y_j13_i2) ;
e0_h_L_j2 = fun_47217__function(e0_h_l_j2_i1,e0_h_l_j2_i2,e0_x_j2_i1,e0_x_j2_i2) ;
e0_h_L_j42 = fun_47217__function(e0_h_l_j42_i1,e0_h_l_j42_i2,e0_x_j42_i1,e0_x_j42_i2) ;
e0_h_V_j2 = fun_47202__function(e0_h_v_j2_i1,e0_h_v_j2_i2,e0_y_j2_i1,e0_y_j2_i2) ;
e0_K_j28_i1 = fun_47167__function(e0_greek_gamma_j28_i1,e0_P_o_j28_i1,e0_P,e0_greek_phi) ;
e0_K_j29_i2 = fun_47167__function(e0_greek_gamma_j29_i2,e0_P_o_j29_i2,e0_P,e0_greek_phi) ;
e0_K_j27_i2 = fun_47167__function(e0_greek_gamma_j27_i2,e0_P_o_j27_i2,e0_P,e0_greek_phi) ;
e0_K_j45_i1 = fun_47167__function(e0_greek_gamma_j45_i1,e0_P_o_j45_i1,e0_P,e0_greek_phi) ;
e0_h_V_j48 = fun_47202__function(e0_h_v_j48_i1,e0_h_v_j48_i2,e0_y_j48_i1,e0_y_j48_i2) ;
e0_h_L_j19 = fun_47217__function(e0_h_l_j19_i1,e0_h_l_j19_i2,e0_x_j19_i1,e0_x_j19_i2) ;
e0_h_L_j28 = fun_47217__function(e0_h_l_j28_i1,e0_h_l_j28_i2,e0_x_j28_i1,e0_x_j28_i2) ;
e0_K_j44_i2 = fun_47167__function(e0_greek_gamma_j44_i2,e0_P_o_j44_i2,e0_P,e0_greek_phi) ;
e0_K_j6_i2 = fun_47167__function(e0_greek_gamma_j6_i2,e0_P_o_j6_i2,e0_P,e0_greek_phi) ;
e0_K_j35_i2 = fun_47167__function(e0_greek_gamma_j35_i2,e0_P_o_j35_i2,e0_P,e0_greek_phi) ;
e0_h_L_j48 = fun_47217__function(e0_h_l_j48_i1,e0_h_l_j48_i2,e0_x_j48_i1,e0_x_j48_i2) ;
e0_h_V_j19 = fun_47202__function(e0_h_v_j19_i1,e0_h_v_j19_i2,e0_y_j19_i1,e0_y_j19_i2) ;
e0_K_j22_i1 = fun_47167__function(e0_greek_gamma_j22_i1,e0_P_o_j22_i1,e0_P,e0_greek_phi) ;

% evaluate the function values
Y(1) = e0_R_c - ( ( e0_L_j0 )/( e0_D_c ) );
Y(2) = e0_y_j1_i1 - ( e0_x_j0_i1 );
Y(3) = e0_y_j1_i2 - ( e0_x_j0_i2 );
Y(4) = e0_y_j1_i1 - ( e0_K_j1_i1 * e0_x_j1_i1 );
Y(5) = e0_y_j2_i1 - ( e0_K_j2_i1 * e0_x_j2_i1 );
Y(6) = e0_y_j3_i1 - ( e0_K_j3_i1 * e0_x_j3_i1 );
Y(7) = e0_y_j4_i1 - ( e0_K_j4_i1 * e0_x_j4_i1 );
Y(8) = e0_y_j5_i1 - ( e0_K_j5_i1 * e0_x_j5_i1 );
Y(9) = e0_y_j6_i1 - ( e0_K_j6_i1 * e0_x_j6_i1 );
Y(10) = e0_y_j7_i1 - ( e0_K_j7_i1 * e0_x_j7_i1 );
Y(11) = e0_y_j8_i1 - ( e0_K_j8_i1 * e0_x_j8_i1 );
Y(12) = e0_y_j9_i1 - ( e0_K_j9_i1 * e0_x_j9_i1 );
Y(13) = e0_y_j10_i1 - ( e0_K_j10_i1 * e0_x_j10_i1 );
Y(14) = e0_y_j11_i1 - ( e0_K_j11_i1 * e0_x_j11_i1 );
Y(15) = e0_y_j12_i1 - ( e0_K_j12_i1 * e0_x_j12_i1 );
Y(16) = e0_y_j13_i1 - ( e0_K_j13_i1 * e0_x_j13_i1 );
Y(17) = e0_y_j14_i1 - ( e0_K_j14_i1 * e0_x_j14_i1 );
Y(18) = e0_y_j15_i1 - ( e0_K_j15_i1 * e0_x_j15_i1 );
Y(19) = e0_y_j16_i1 - ( e0_K_j16_i1 * e0_x_j16_i1 );
Y(20) = e0_y_j17_i1 - ( e0_K_j17_i1 * e0_x_j17_i1 );
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Y(21) = e0_y_j18_i1 - ( e0_K_j18_i1 * e0_x_j18_i1 );
Y(22) = e0_y_j19_i1 - ( e0_K_j19_i1 * e0_x_j19_i1 );
Y(23) = e0_y_j20_i1 - ( e0_K_j20_i1 * e0_x_j20_i1 );
Y(24) = e0_y_j21_i1 - ( e0_K_j21_i1 * e0_x_j21_i1 );
Y(25) = e0_y_j22_i1 - ( e0_K_j22_i1 * e0_x_j22_i1 );
Y(26) = e0_y_j23_i1 - ( e0_K_j23_i1 * e0_x_j23_i1 );
Y(27) = e0_y_j24_i1 - ( e0_K_j24_i1 * e0_x_j24_i1 );
Y(28) = e0_y_j25_i1 - ( e0_K_j25_i1 * e0_x_j25_i1 );
Y(29) = e0_y_j26_i1 - ( e0_K_j26_i1 * e0_x_j26_i1 );
Y(30) = e0_y_j27_i1 - ( e0_K_j27_i1 * e0_x_j27_i1 );
Y(31) = e0_y_j28_i1 - ( e0_K_j28_i1 * e0_x_j28_i1 );
Y(32) = e0_y_j29_i1 - ( e0_K_j29_i1 * e0_x_j29_i1 );
Y(33) = e0_y_j30_i1 - ( e0_K_j30_i1 * e0_x_j30_i1 );
Y(34) = e0_y_j31_i1 - ( e0_K_j31_i1 * e0_x_j31_i1 );
Y(35) = e0_y_j32_i1 - ( e0_K_j32_i1 * e0_x_j32_i1 );
Y(36) = e0_y_j33_i1 - ( e0_K_j33_i1 * e0_x_j33_i1 );
Y(37) = e0_y_j34_i1 - ( e0_K_j34_i1 * e0_x_j34_i1 );
Y(38) = e0_y_j35_i1 - ( e0_K_j35_i1 * e0_x_j35_i1 );
Y(39) = e0_y_j36_i1 - ( e0_K_j36_i1 * e0_x_j36_i1 );
Y(40) = e0_y_j37_i1 - ( e0_K_j37_i1 * e0_x_j37_i1 );
Y(41) = e0_y_j38_i1 - ( e0_K_j38_i1 * e0_x_j38_i1 );
Y(42) = e0_y_j39_i1 - ( e0_K_j39_i1 * e0_x_j39_i1 );
Y(43) = e0_y_j40_i1 - ( e0_K_j40_i1 * e0_x_j40_i1 );
Y(44) = e0_y_j41_i1 - ( e0_K_j41_i1 * e0_x_j41_i1 );
Y(45) = e0_y_j42_i1 - ( e0_K_j42_i1 * e0_x_j42_i1 );
Y(46) = e0_y_j43_i1 - ( e0_K_j43_i1 * e0_x_j43_i1 );
Y(47) = e0_y_j44_i1 - ( e0_K_j44_i1 * e0_x_j44_i1 );
Y(48) = e0_y_j45_i1 - ( e0_K_j45_i1 * e0_x_j45_i1 );
Y(49) = e0_y_j46_i1 - ( e0_K_j46_i1 * e0_x_j46_i1 );
Y(50) = e0_y_j47_i1 - ( e0_K_j47_i1 * e0_x_j47_i1 );
Y(51) = e0_y_j48_i1 - ( e0_K_j48_i1 * e0_x_j48_i1 );
Y(52) = e0_y_j49_i1 - ( e0_K_j49_i1 * e0_x_j49_i1 );
Y(53) = e0_y_j1_i2 - ( e0_K_j1_i2 * e0_x_j1_i2 );
Y(54) = e0_y_j2_i2 - ( e0_K_j2_i2 * e0_x_j2_i2 );
Y(55) = e0_y_j3_i2 - ( e0_K_j3_i2 * e0_x_j3_i2 );
Y(56) = e0_y_j4_i2 - ( e0_K_j4_i2 * e0_x_j4_i2 );
Y(57) = e0_y_j5_i2 - ( e0_K_j5_i2 * e0_x_j5_i2 );
Y(58) = e0_y_j6_i2 - ( e0_K_j6_i2 * e0_x_j6_i2 );
Y(59) = e0_y_j7_i2 - ( e0_K_j7_i2 * e0_x_j7_i2 );
Y(60) = e0_y_j8_i2 - ( e0_K_j8_i2 * e0_x_j8_i2 );
Y(61) = e0_y_j9_i2 - ( e0_K_j9_i2 * e0_x_j9_i2 );
Y(62) = e0_y_j10_i2 - ( e0_K_j10_i2 * e0_x_j10_i2 );
Y(63) = e0_y_j11_i2 - ( e0_K_j11_i2 * e0_x_j11_i2 );
Y(64) = e0_y_j12_i2 - ( e0_K_j12_i2 * e0_x_j12_i2 );
Y(65) = e0_y_j13_i2 - ( e0_K_j13_i2 * e0_x_j13_i2 );
Y(66) = e0_y_j14_i2 - ( e0_K_j14_i2 * e0_x_j14_i2 );
Y(67) = e0_y_j15_i2 - ( e0_K_j15_i2 * e0_x_j15_i2 );
Y(68) = e0_y_j16_i2 - ( e0_K_j16_i2 * e0_x_j16_i2 );
Y(69) = e0_y_j17_i2 - ( e0_K_j17_i2 * e0_x_j17_i2 );
Y(70) = e0_y_j18_i2 - ( e0_K_j18_i2 * e0_x_j18_i2 );
Y(71) = e0_y_j19_i2 - ( e0_K_j19_i2 * e0_x_j19_i2 );
Y(72) = e0_y_j20_i2 - ( e0_K_j20_i2 * e0_x_j20_i2 );
Y(73) = e0_y_j21_i2 - ( e0_K_j21_i2 * e0_x_j21_i2 );
Y(74) = e0_y_j22_i2 - ( e0_K_j22_i2 * e0_x_j22_i2 );
Y(75) = e0_y_j23_i2 - ( e0_K_j23_i2 * e0_x_j23_i2 );
Y(76) = e0_y_j24_i2 - ( e0_K_j24_i2 * e0_x_j24_i2 );
Y(77) = e0_y_j25_i2 - ( e0_K_j25_i2 * e0_x_j25_i2 );
Y(78) = e0_y_j26_i2 - ( e0_K_j26_i2 * e0_x_j26_i2 );
Y(79) = e0_y_j27_i2 - ( e0_K_j27_i2 * e0_x_j27_i2 );
Y(80) = e0_y_j28_i2 - ( e0_K_j28_i2 * e0_x_j28_i2 );
Y(81) = e0_y_j29_i2 - ( e0_K_j29_i2 * e0_x_j29_i2 );
Y(82) = e0_y_j30_i2 - ( e0_K_j30_i2 * e0_x_j30_i2 );
Y(83) = e0_y_j31_i2 - ( e0_K_j31_i2 * e0_x_j31_i2 );
Y(84) = e0_y_j32_i2 - ( e0_K_j32_i2 * e0_x_j32_i2 );
Y(85) = e0_y_j33_i2 - ( e0_K_j33_i2 * e0_x_j33_i2 );
Y(86) = e0_y_j34_i2 - ( e0_K_j34_i2 * e0_x_j34_i2 );
Y(87) = e0_y_j35_i2 - ( e0_K_j35_i2 * e0_x_j35_i2 );
Y(88) = e0_y_j36_i2 - ( e0_K_j36_i2 * e0_x_j36_i2 );
Y(89) = e0_y_j37_i2 - ( e0_K_j37_i2 * e0_x_j37_i2 );
Y(90) = e0_y_j38_i2 - ( e0_K_j38_i2 * e0_x_j38_i2 );
Y(91) = e0_y_j39_i2 - ( e0_K_j39_i2 * e0_x_j39_i2 );
Y(92) = e0_y_j40_i2 - ( e0_K_j40_i2 * e0_x_j40_i2 );
Y(93) = e0_y_j41_i2 - ( e0_K_j41_i2 * e0_x_j41_i2 );
Y(94) = e0_y_j42_i2 - ( e0_K_j42_i2 * e0_x_j42_i2 );
Y(95) = e0_y_j43_i2 - ( e0_K_j43_i2 * e0_x_j43_i2 );
Y(96) = e0_y_j44_i2 - ( e0_K_j44_i2 * e0_x_j44_i2 );
Y(97) = e0_y_j45_i2 - ( e0_K_j45_i2 * e0_x_j45_i2 );
Y(98) = e0_y_j46_i2 - ( e0_K_j46_i2 * e0_x_j46_i2 );
Y(99) = e0_y_j47_i2 - ( e0_K_j47_i2 * e0_x_j47_i2 );
Y(100) = e0_y_j48_i2 - ( e0_K_j48_i2 * e0_x_j48_i2 );
Y(101) = e0_y_j49_i2 - ( e0_K_j49_i2 * e0_x_j49_i2 );
Y(102) = e0_y_j49_i1 - ( e0_K_j49_i1 * e0_x_j49_i1 );
Y(103) = e0_y_j49_i2 - ( e0_K_j49_i2 * e0_x_j49_i2 );
Y(104) = ( e0_y_j1_i1 + e0_y_j1_i2 ) - ( 1.0 );
Y(105) = ( e0_y_j2_i1 + e0_y_j2_i2 ) - ( 1.0 );
Y(106) = ( e0_y_j3_i1 + e0_y_j3_i2 ) - ( 1.0 );
Y(107) = ( e0_y_j4_i1 + e0_y_j4_i2 ) - ( 1.0 );
Y(108) = ( e0_y_j5_i1 + e0_y_j5_i2 ) - ( 1.0 );
Y(109) = ( e0_y_j6_i1 + e0_y_j6_i2 ) - ( 1.0 );
Y(110) = ( e0_y_j7_i1 + e0_y_j7_i2 ) - ( 1.0 );
Y(111) = ( e0_y_j8_i1 + e0_y_j8_i2 ) - ( 1.0 );
Y(112) = ( e0_y_j9_i1 + e0_y_j9_i2 ) - ( 1.0 );
Y(113) = ( e0_y_j10_i1 + e0_y_j10_i2 ) - ( 1.0 );
Y(114) = ( e0_y_j11_i1 + e0_y_j11_i2 ) - ( 1.0 );
Y(115) = ( e0_y_j12_i1 + e0_y_j12_i2 ) - ( 1.0 );
Y(116) = ( e0_y_j13_i1 + e0_y_j13_i2 ) - ( 1.0 );
Y(117) = ( e0_y_j14_i1 + e0_y_j14_i2 ) - ( 1.0 );
Y(118) = ( e0_y_j15_i1 + e0_y_j15_i2 ) - ( 1.0 );
Y(119) = ( e0_y_j16_i1 + e0_y_j16_i2 ) - ( 1.0 );
Y(120) = ( e0_y_j17_i1 + e0_y_j17_i2 ) - ( 1.0 );
Y(121) = ( e0_y_j18_i1 + e0_y_j18_i2 ) - ( 1.0 );
Y(122) = ( e0_y_j19_i1 + e0_y_j19_i2 ) - ( 1.0 );
Y(123) = ( e0_y_j20_i1 + e0_y_j20_i2 ) - ( 1.0 );
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    Y(124) = ( e0_y_j21_i1 + e0_y_j21_i2 ) - ( 1.0 );
    Y(125) = ( e0_y_j22_i1 + e0_y_j22_i2 ) - ( 1.0 );
    Y(126) = ( e0_y_j23_i1 + e0_y_j23_i2 ) - ( 1.0 );
    Y(127) = ( e0_y_j24_i1 + e0_y_j24_i2 ) - ( 1.0 );
    Y(128) = ( e0_y_j25_i1 + e0_y_j25_i2 ) - ( 1.0 );
    Y(129) = ( e0_y_j26_i1 + e0_y_j26_i2 ) - ( 1.0 );
    Y(130) = ( e0_y_j27_i1 + e0_y_j27_i2 ) - ( 1.0 );
    Y(131) = ( e0_y_j28_i1 + e0_y_j28_i2 ) - ( 1.0 );
    Y(132) = ( e0_y_j29_i1 + e0_y_j29_i2 ) - ( 1.0 );
    Y(133) = ( e0_y_j30_i1 + e0_y_j30_i2 ) - ( 1.0 );
    Y(134) = ( e0_y_j31_i1 + e0_y_j31_i2 ) - ( 1.0 );
    Y(135) = ( e0_y_j32_i1 + e0_y_j32_i2 ) - ( 1.0 );
    Y(136) = ( e0_y_j33_i1 + e0_y_j33_i2 ) - ( 1.0 );
    Y(137) = ( e0_y_j34_i1 + e0_y_j34_i2 ) - ( 1.0 );
    Y(138) = ( e0_y_j35_i1 + e0_y_j35_i2 ) - ( 1.0 );
    Y(139) = ( e0_y_j36_i1 + e0_y_j36_i2 ) - ( 1.0 );
    Y(140) = ( e0_y_j37_i1 + e0_y_j37_i2 ) - ( 1.0 );
    Y(141) = ( e0_y_j38_i1 + e0_y_j38_i2 ) - ( 1.0 );
    Y(142) = ( e0_y_j39_i1 + e0_y_j39_i2 ) - ( 1.0 );
    Y(143) = ( e0_y_j40_i1 + e0_y_j40_i2 ) - ( 1.0 );
    Y(144) = ( e0_y_j41_i1 + e0_y_j41_i2 ) - ( 1.0 );
    Y(145) = ( e0_y_j42_i1 + e0_y_j42_i2 ) - ( 1.0 );
    Y(146) = ( e0_y_j43_i1 + e0_y_j43_i2 ) - ( 1.0 );
    Y(147) = ( e0_y_j44_i1 + e0_y_j44_i2 ) - ( 1.0 );
    Y(148) = ( e0_y_j45_i1 + e0_y_j45_i2 ) - ( 1.0 );
    Y(149) = ( e0_y_j46_i1 + e0_y_j46_i2 ) - ( 1.0 );
    Y(150) = ( e0_y_j47_i1 + e0_y_j47_i2 ) - ( 1.0 );
    Y(151) = ( e0_y_j48_i1 + e0_y_j48_i2 ) - ( 1.0 );
    Y(152) = ( e0_y_j49_i1 + e0_y_j49_i2 ) - ( 1.0 );
    Y(153) = 0.0 - ( e0_F_j1 * e0_h_F + e0_L_j0 * e0_h_L_j0 + e0_V_j2 * e0_h_V_j2 - e0_V_j1 * e0_h_V_j1 - e0_L_j1 *
e0_h_L_j1 );
    Y(154) = 0.0 - ( e0_F_j2 * e0_h_F + e0_L_j1 * e0_h_L_j1 + e0_V_j3 * e0_h_V_j3 - e0_V_j2 * e0_h_V_j2 - e0_L_j2 *
e0_h_L_j2 );
    Y(155) = 0.0 - ( e0_F_j3 * e0_h_F + e0_L_j2 * e0_h_L_j2 + e0_V_j4 * e0_h_V_j4 - e0_V_j3 * e0_h_V_j3 - e0_L_j3 *
e0_h_L_j3 );
    Y(156) = 0.0 - ( e0_F_j4 * e0_h_F + e0_L_j3 * e0_h_L_j3 + e0_V_j5 * e0_h_V_j5 - e0_V_j4 * e0_h_V_j4 - e0_L_j4 *
e0_h_L_j4 );
    Y(157) = 0.0 - ( e0_F_j5 * e0_h_F + e0_L_j4 * e0_h_L_j4 + e0_V_j6 * e0_h_V_j6 - e0_V_j5 * e0_h_V_j5 - e0_L_j5 *
e0_h_L_j5 );
    Y(158) = 0.0 - ( e0_F_j6 * e0_h_F + e0_L_j5 * e0_h_L_j5 + e0_V_j7 * e0_h_V_j7 - e0_V_j6 * e0_h_V_j6 - e0_L_j6 *
e0_h_L_j6 );
    Y(159) = 0.0 - ( e0_F_j7 * e0_h_F + e0_L_j6 * e0_h_L_j6 + e0_V_j8 * e0_h_V_j8 - e0_V_j7 * e0_h_V_j7 - e0_L_j7 *
e0_h_L_j7 );
    Y(160) = 0.0 - ( e0_F_j8 * e0_h_F + e0_L_j7 * e0_h_L_j7 + e0_V_j9 * e0_h_V_j9 - e0_V_j8 * e0_h_V_j8 - e0_L_j8 *
e0_h_L_j8 );
    Y(161) = 0.0 - ( e0_F_j9 * e0_h_F + e0_L_j8 * e0_h_L_j8 + e0_V_j10 * e0_h_V_j10 - e0_V_j9 * e0_h_V_j9 - e0_L_j9 *
e0_h_L_j9 );
    Y(162) = 0.0 - ( e0_F_j10 * e0_h_F + e0_L_j9 * e0_h_L_j9 + e0_V_j11 * e0_h_V_j11 - e0_V_j10 * e0_h_V_j10 -
e0_L_j10 * e0_h_L_j10 );
    Y(163) = 0.0 - ( e0_F_j11 * e0_h_F + e0_L_j10 * e0_h_L_j10 + e0_V_j12 * e0_h_V_j12 - e0_V_j11 * e0_h_V_j11 -
e0_L_j11 * e0_h_L_j11 );
    Y(164) = 0.0 - ( e0_F_j12 * e0_h_F + e0_L_j11 * e0_h_L_j11 + e0_V_j13 * e0_h_V_j13 - e0_V_j12 * e0_h_V_j12 -
e0_L_j12 * e0_h_L_j12 );
    Y(165) = 0.0 - ( e0_F_j13 * e0_h_F + e0_L_j12 * e0_h_L_j12 + e0_V_j14 * e0_h_V_j14 - e0_V_j13 * e0_h_V_j13 -
e0_L_j13 * e0_h_L_j13 );
    Y(166) = 0.0 - ( e0_F_j14 * e0_h_F + e0_L_j13 * e0_h_L_j13 + e0_V_j15 * e0_h_V_j15 - e0_V_j14 * e0_h_V_j14 -
e0_L_j14 * e0_h_L_j14 );
    Y(167) = 0.0 - ( e0_F_j15 * e0_h_F + e0_L_j14 * e0_h_L_j14 + e0_V_j16 * e0_h_V_j16 - e0_V_j15 * e0_h_V_j15 -
e0_L_j15 * e0_h_L_j15 );
    Y(168) = 0.0 - ( e0_F_j16 * e0_h_F + e0_L_j15 * e0_h_L_j15 + e0_V_j17 * e0_h_V_j17 - e0_V_j16 * e0_h_V_j16 -
e0_L_j16 * e0_h_L_j16 );
    Y(169) = 0.0 - ( e0_F_j17 * e0_h_F + e0_L_j16 * e0_h_L_j16 + e0_V_j18 * e0_h_V_j18 - e0_V_j17 * e0_h_V_j17 -
e0_L_j17 * e0_h_L_j17 );
    Y(170) = 0.0 - ( e0_F_j18 * e0_h_F + e0_L_j17 * e0_h_L_j17 + e0_V_j19 * e0_h_V_j19 - e0_V_j18 * e0_h_V_j18 -
e0_L_j18 * e0_h_L_j18 );
    Y(171) = 0.0 - ( e0_F_j19 * e0_h_F + e0_L_j18 * e0_h_L_j18 + e0_V_j20 * e0_h_V_j20 - e0_V_j19 * e0_h_V_j19 -
e0_L_j19 * e0_h_L_j19 );
    Y(172) = 0.0 - ( e0_F_j20 * e0_h_F + e0_L_j19 * e0_h_L_j19 + e0_V_j21 * e0_h_V_j21 - e0_V_j20 * e0_h_V_j20 -
e0_L_j20 * e0_h_L_j20 );
    Y(173) = 0.0 - ( e0_F_j21 * e0_h_F + e0_L_j20 * e0_h_L_j20 + e0_V_j22 * e0_h_V_j22 - e0_V_j21 * e0_h_V_j21 -
e0_L_j21 * e0_h_L_j21 );
    Y(174) = 0.0 - ( e0_F_j22 * e0_h_F + e0_L_j21 * e0_h_L_j21 + e0_V_j23 * e0_h_V_j23 - e0_V_j22 * e0_h_V_j22 -
e0_L_j22 * e0_h_L_j22 );
    Y(175) = 0.0 - ( e0_F_j23 * e0_h_F + e0_L_j22 * e0_h_L_j22 + e0_V_j24 * e0_h_V_j24 - e0_V_j23 * e0_h_V_j23 -
e0_L_j23 * e0_h_L_j23 );
    Y(176) = 0.0 - ( e0_F_j24 * e0_h_F + e0_L_j23 * e0_h_L_j23 + e0_V_j25 * e0_h_V_j25 - e0_V_j24 * e0_h_V_j24 -
e0_L_j24 * e0_h_L_j24 );
    Y(177) = 0.0 - ( e0_F_j25 * e0_h_F + e0_L_j24 * e0_h_L_j24 + e0_V_j26 * e0_h_V_j26 - e0_V_j25 * e0_h_V_j25 -
e0_L_j25 * e0_h_L_j25 );
    Y(178) = 0.0 - ( e0_F_j26 * e0_h_F + e0_L_j25 * e0_h_L_j25 + e0_V_j27 * e0_h_V_j27 - e0_V_j26 * e0_h_V_j26 -
e0_L_j26 * e0_h_L_j26 );
    Y(179) = 0.0 - ( e0_F_j27 * e0_h_F + e0_L_j26 * e0_h_L_j26 + e0_V_j28 * e0_h_V_j28 - e0_V_j27 * e0_h_V_j27 -
e0_L_j27 * e0_h_L_j27 );
    Y(180) = 0.0 - ( e0_F_j28 * e0_h_F + e0_L_j27 * e0_h_L_j27 + e0_V_j29 * e0_h_V_j29 - e0_V_j28 * e0_h_V_j28 -
e0_L_j28 * e0_h_L_j28 );
    Y(181) = 0.0 - ( e0_F_j29 * e0_h_F + e0_L_j28 * e0_h_L_j28 + e0_V_j30 * e0_h_V_j30 - e0_V_j29 * e0_h_V_j29 -
e0_L_j29 * e0_h_L_j29 );
    Y(182) = 0.0 - ( e0_F_j30 * e0_h_F + e0_L_j29 * e0_h_L_j29 + e0_V_j31 * e0_h_V_j31 - e0_V_j30 * e0_h_V_j30 -
e0_L_j30 * e0_h_L_j30 );
    Y(183) = 0.0 - ( e0_F_j31 * e0_h_F + e0_L_j30 * e0_h_L_j30 + e0_V_j32 * e0_h_V_j32 - e0_V_j31 * e0_h_V_j31 -
e0_L_j31 * e0_h_L_j31 );
    Y(184) = 0.0 - ( e0_F_j32 * e0_h_F + e0_L_j31 * e0_h_L_j31 + e0_V_j33 * e0_h_V_j33 - e0_V_j32 * e0_h_V_j32 -
e0_L_j32 * e0_h_L_j32 );
    Y(185) = 0.0 - ( e0_F_j33 * e0_h_F + e0_L_j32 * e0_h_L_j32 + e0_V_j34 * e0_h_V_j34 - e0_V_j33 * e0_h_V_j33 -
e0_L_j33 * e0_h_L_j33 );
    Y(186) = 0.0 - ( e0_F_j34 * e0_h_F + e0_L_j33 * e0_h_L_j33 + e0_V_j35 * e0_h_V_j35 - e0_V_j34 * e0_h_V_j34 -
e0_L_j34 * e0_h_L_j34 );
    Y(187) = 0.0 - ( e0_F_j35 * e0_h_F + e0_L_j34 * e0_h_L_j34 + e0_V_j36 * e0_h_V_j36 - e0_V_j35 * e0_h_V_j35 -
e0_L_j35 * e0_h_L_j35 );
    Y(188) = 0.0 - ( e0_F_j36 * e0_h_F + e0_L_j35 * e0_h_L_j35 + e0_V_j37 * e0_h_V_j37 - e0_V_j36 * e0_h_V_j36 -
e0_L_j36 * e0_h_L_j36 );
    Y(189) = 0.0 - ( e0_F_j37 * e0_h_F + e0_L_j36 * e0_h_L_j36 + e0_V_j38 * e0_h_V_j38 - e0_V_j37 * e0_h_V_j37 -
e0_L_j37 * e0_h_L_j37 );
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    Y(190) = 0.0 - ( e0_F_j38 * e0_h_F + e0_L_j37 * e0_h_L_j37 + e0_V_j39 * e0_h_V_j39 - e0_V_j38 * e0_h_V_j38 -
e0_L_j38 * e0_h_L_j38 );
    Y(191) = 0.0 - ( e0_F_j39 * e0_h_F + e0_L_j38 * e0_h_L_j38 + e0_V_j40 * e0_h_V_j40 - e0_V_j39 * e0_h_V_j39 -
e0_L_j39 * e0_h_L_j39 );
    Y(192) = 0.0 - ( e0_F_j40 * e0_h_F + e0_L_j39 * e0_h_L_j39 + e0_V_j41 * e0_h_V_j41 - e0_V_j40 * e0_h_V_j40 -
e0_L_j40 * e0_h_L_j40 );
    Y(193) = 0.0 - ( e0_F_j41 * e0_h_F + e0_L_j40 * e0_h_L_j40 + e0_V_j42 * e0_h_V_j42 - e0_V_j41 * e0_h_V_j41 -
e0_L_j41 * e0_h_L_j41 );
    Y(194) = 0.0 - ( e0_F_j42 * e0_h_F + e0_L_j41 * e0_h_L_j41 + e0_V_j43 * e0_h_V_j43 - e0_V_j42 * e0_h_V_j42 -
e0_L_j42 * e0_h_L_j42 );
    Y(195) = 0.0 - ( e0_F_j43 * e0_h_F + e0_L_j42 * e0_h_L_j42 + e0_V_j44 * e0_h_V_j44 - e0_V_j43 * e0_h_V_j43 -
e0_L_j43 * e0_h_L_j43 );
    Y(196) = 0.0 - ( e0_F_j44 * e0_h_F + e0_L_j43 * e0_h_L_j43 + e0_V_j45 * e0_h_V_j45 - e0_V_j44 * e0_h_V_j44 -
e0_L_j44 * e0_h_L_j44 );
    Y(197) = 0.0 - ( e0_F_j45 * e0_h_F + e0_L_j44 * e0_h_L_j44 + e0_V_j46 * e0_h_V_j46 - e0_V_j45 * e0_h_V_j45 -
e0_L_j45 * e0_h_L_j45 );
    Y(198) = 0.0 - ( e0_F_j46 * e0_h_F + e0_L_j45 * e0_h_L_j45 + e0_V_j47 * e0_h_V_j47 - e0_V_j46 * e0_h_V_j46 -
e0_L_j46 * e0_h_L_j46 );
    Y(199) = 0.0 - ( e0_F_j47 * e0_h_F + e0_L_j46 * e0_h_L_j46 + e0_V_j48 * e0_h_V_j48 - e0_V_j47 * e0_h_V_j47 -
e0_L_j47 * e0_h_L_j47 );
    Y(200) = 0.0 - ( e0_F_j48 * e0_h_F + e0_L_j47 * e0_h_L_j47 + e0_V_j49 * e0_h_V_j49 - e0_V_j48 * e0_h_V_j48 -
e0_L_j48 * e0_h_L_j48 );
    Y(201) = 0.0 - ( e0_F_j49 * e0_h_F + e0_L_j48 * e0_h_L_j48 + e0_V_j50 * e0_h_V_j50 - e0_V_j49 * e0_h_V_j49 -
e0_L_j49 * e0_h_L_j49 );
    Y(202) = e0_B_r * e0_h_L_j49 - ( e0_L_j48 * e0_h_L_j48 - e0_V_j49 * e0_h_V_j49 + e0_Q_r );
    Y(203) = 0.0 - ( e0_F_j1 * e0_z_i1 - e0_L_j1 * e0_x_j1_i1 - e0_V_j1 * e0_y_j1_i1 + e0_V_j2 * e0_y_j2_i1 + e0_L_j0
* e0_x_j0_i1 );
    Y(204) = 0.0 - ( e0_F_j2 * e0_z_i1 - e0_L_j2 * e0_x_j2_i1 - e0_V_j2 * e0_y_j2_i1 + e0_V_j3 * e0_y_j3_i1 + e0_L_j1
* e0_x_j1_i1 );
    Y(205) = 0.0 - ( e0_F_j3 * e0_z_i1 - e0_L_j3 * e0_x_j3_i1 - e0_V_j3 * e0_y_j3_i1 + e0_V_j4 * e0_y_j4_i1 + e0_L_j2
* e0_x_j2_i1 );
    Y(206) = 0.0 - ( e0_F_j4 * e0_z_i1 - e0_L_j4 * e0_x_j4_i1 - e0_V_j4 * e0_y_j4_i1 + e0_V_j5 * e0_y_j5_i1 + e0_L_j3
* e0_x_j3_i1 );
    Y(207) = 0.0 - ( e0_F_j5 * e0_z_i1 - e0_L_j5 * e0_x_j5_i1 - e0_V_j5 * e0_y_j5_i1 + e0_V_j6 * e0_y_j6_i1 + e0_L_j4
* e0_x_j4_i1 );
    Y(208) = 0.0 - ( e0_F_j6 * e0_z_i1 - e0_L_j6 * e0_x_j6_i1 - e0_V_j6 * e0_y_j6_i1 + e0_V_j7 * e0_y_j7_i1 + e0_L_j5
* e0_x_j5_i1 );
    Y(209) = 0.0 - ( e0_F_j7 * e0_z_i1 - e0_L_j7 * e0_x_j7_i1 - e0_V_j7 * e0_y_j7_i1 + e0_V_j8 * e0_y_j8_i1 + e0_L_j6
* e0_x_j6_i1 );
    Y(210) = 0.0 - ( e0_F_j8 * e0_z_i1 - e0_L_j8 * e0_x_j8_i1 - e0_V_j8 * e0_y_j8_i1 + e0_V_j9 * e0_y_j9_i1 + e0_L_j7
* e0_x_j7_i1 );
    Y(211) = 0.0 - ( e0_F_j9 * e0_z_i1 - e0_L_j9 * e0_x_j9_i1 - e0_V_j9 * e0_y_j9_i1 + e0_V_j10 * e0_y_j10_i1 +
e0_L_j8 * e0_x_j8_i1 );
    Y(212) = 0.0 - ( e0_F_j10 * e0_z_i1 - e0_L_j10 * e0_x_j10_i1 - e0_V_j10 * e0_y_j10_i1 + e0_V_j11 * e0_y_j11_i1 +
e0_L_j9 * e0_x_j9_i1 );
    Y(213) = 0.0 - ( e0_F_j11 * e0_z_i1 - e0_L_j11 * e0_x_j11_i1 - e0_V_j11 * e0_y_j11_i1 + e0_V_j12 * e0_y_j12_i1 +
e0_L_j10 * e0_x_j10_i1 );
    Y(214) = 0.0 - ( e0_F_j12 * e0_z_i1 - e0_L_j12 * e0_x_j12_i1 - e0_V_j12 * e0_y_j12_i1 + e0_V_j13 * e0_y_j13_i1 +
e0_L_j11 * e0_x_j11_i1 );
    Y(215) = 0.0 - ( e0_F_j13 * e0_z_i1 - e0_L_j13 * e0_x_j13_i1 - e0_V_j13 * e0_y_j13_i1 + e0_V_j14 * e0_y_j14_i1 +
e0_L_j12 * e0_x_j12_i1 );
    Y(216) = 0.0 - ( e0_F_j14 * e0_z_i1 - e0_L_j14 * e0_x_j14_i1 - e0_V_j14 * e0_y_j14_i1 + e0_V_j15 * e0_y_j15_i1 +
e0_L_j13 * e0_x_j13_i1 );
    Y(217) = 0.0 - ( e0_F_j15 * e0_z_i1 - e0_L_j15 * e0_x_j15_i1 - e0_V_j15 * e0_y_j15_i1 + e0_V_j16 * e0_y_j16_i1 +
e0_L_j14 * e0_x_j14_i1 );
    Y(218) = 0.0 - ( e0_F_j16 * e0_z_i1 - e0_L_j16 * e0_x_j16_i1 - e0_V_j16 * e0_y_j16_i1 + e0_V_j17 * e0_y_j17_i1 +
e0_L_j15 * e0_x_j15_i1 );
    Y(219) = 0.0 - ( e0_F_j17 * e0_z_i1 - e0_L_j17 * e0_x_j17_i1 - e0_V_j17 * e0_y_j17_i1 + e0_V_j18 * e0_y_j18_i1 +
e0_L_j16 * e0_x_j16_i1 );
    Y(220) = 0.0 - ( e0_F_j18 * e0_z_i1 - e0_L_j18 * e0_x_j18_i1 - e0_V_j18 * e0_y_j18_i1 + e0_V_j19 * e0_y_j19_i1 +
e0_L_j17 * e0_x_j17_i1 );
    Y(221) = 0.0 - ( e0_F_j19 * e0_z_i1 - e0_L_j19 * e0_x_j19_i1 - e0_V_j19 * e0_y_j19_i1 + e0_V_j20 * e0_y_j20_i1 +
e0_L_j18 * e0_x_j18_i1 );
    Y(222) = 0.0 - ( e0_F_j20 * e0_z_i1 - e0_L_j20 * e0_x_j20_i1 - e0_V_j20 * e0_y_j20_i1 + e0_V_j21 * e0_y_j21_i1 +
e0_L_j19 * e0_x_j19_i1 );
    Y(223) = 0.0 - ( e0_F_j21 * e0_z_i1 - e0_L_j21 * e0_x_j21_i1 - e0_V_j21 * e0_y_j21_i1 + e0_V_j22 * e0_y_j22_i1 +
e0_L_j20 * e0_x_j20_i1 );
    Y(224) = 0.0 - ( e0_F_j22 * e0_z_i1 - e0_L_j22 * e0_x_j22_i1 - e0_V_j22 * e0_y_j22_i1 + e0_V_j23 * e0_y_j23_i1 +
e0_L_j21 * e0_x_j21_i1 );
    Y(225) = 0.0 - ( e0_F_j23 * e0_z_i1 - e0_L_j23 * e0_x_j23_i1 - e0_V_j23 * e0_y_j23_i1 + e0_V_j24 * e0_y_j24_i1 +
e0_L_j22 * e0_x_j22_i1 );
    Y(226) = 0.0 - ( e0_F_j24 * e0_z_i1 - e0_L_j24 * e0_x_j24_i1 - e0_V_j24 * e0_y_j24_i1 + e0_V_j25 * e0_y_j25_i1 +
e0_L_j23 * e0_x_j23_i1 );
    Y(227) = 0.0 - ( e0_F_j25 * e0_z_i1 - e0_L_j25 * e0_x_j25_i1 - e0_V_j25 * e0_y_j25_i1 + e0_V_j26 * e0_y_j26_i1 +
e0_L_j24 * e0_x_j24_i1 );
    Y(228) = 0.0 - ( e0_F_j26 * e0_z_i1 - e0_L_j26 * e0_x_j26_i1 - e0_V_j26 * e0_y_j26_i1 + e0_V_j27 * e0_y_j27_i1 +
e0_L_j25 * e0_x_j25_i1 );
    Y(229) = 0.0 - ( e0_F_j27 * e0_z_i1 - e0_L_j27 * e0_x_j27_i1 - e0_V_j27 * e0_y_j27_i1 + e0_V_j28 * e0_y_j28_i1 +
e0_L_j26 * e0_x_j26_i1 );
    Y(230) = 0.0 - ( e0_F_j28 * e0_z_i1 - e0_L_j28 * e0_x_j28_i1 - e0_V_j28 * e0_y_j28_i1 + e0_V_j29 * e0_y_j29_i1 +
e0_L_j27 * e0_x_j27_i1 );
    Y(231) = 0.0 - ( e0_F_j29 * e0_z_i1 - e0_L_j29 * e0_x_j29_i1 - e0_V_j29 * e0_y_j29_i1 + e0_V_j30 * e0_y_j30_i1 +
e0_L_j28 * e0_x_j28_i1 );
    Y(232) = 0.0 - ( e0_F_j30 * e0_z_i1 - e0_L_j30 * e0_x_j30_i1 - e0_V_j30 * e0_y_j30_i1 + e0_V_j31 * e0_y_j31_i1 +
e0_L_j29 * e0_x_j29_i1 );
    Y(233) = 0.0 - ( e0_F_j31 * e0_z_i1 - e0_L_j31 * e0_x_j31_i1 - e0_V_j31 * e0_y_j31_i1 + e0_V_j32 * e0_y_j32_i1 +
e0_L_j30 * e0_x_j30_i1 );
    Y(234) = 0.0 - ( e0_F_j32 * e0_z_i1 - e0_L_j32 * e0_x_j32_i1 - e0_V_j32 * e0_y_j32_i1 + e0_V_j33 * e0_y_j33_i1 +
e0_L_j31 * e0_x_j31_i1 );
    Y(235) = 0.0 - ( e0_F_j33 * e0_z_i1 - e0_L_j33 * e0_x_j33_i1 - e0_V_j33 * e0_y_j33_i1 + e0_V_j34 * e0_y_j34_i1 +
e0_L_j32 * e0_x_j32_i1 );
    Y(236) = 0.0 - ( e0_F_j34 * e0_z_i1 - e0_L_j34 * e0_x_j34_i1 - e0_V_j34 * e0_y_j34_i1 + e0_V_j35 * e0_y_j35_i1 +
e0_L_j33 * e0_x_j33_i1 );
    Y(237) = 0.0 - ( e0_F_j35 * e0_z_i1 - e0_L_j35 * e0_x_j35_i1 - e0_V_j35 * e0_y_j35_i1 + e0_V_j36 * e0_y_j36_i1 +
e0_L_j34 * e0_x_j34_i1 );
    Y(238) = 0.0 - ( e0_F_j36 * e0_z_i1 - e0_L_j36 * e0_x_j36_i1 - e0_V_j36 * e0_y_j36_i1 + e0_V_j37 * e0_y_j37_i1 +
e0_L_j35 * e0_x_j35_i1 );
    Y(239) = 0.0 - ( e0_F_j37 * e0_z_i1 - e0_L_j37 * e0_x_j37_i1 - e0_V_j37 * e0_y_j37_i1 + e0_V_j38 * e0_y_j38_i1 +
e0_L_j36 * e0_x_j36_i1 );
    Y(240) = 0.0 - ( e0_F_j38 * e0_z_i1 - e0_L_j38 * e0_x_j38_i1 - e0_V_j38 * e0_y_j38_i1 + e0_V_j39 * e0_y_j39_i1 +
e0_L_j37 * e0_x_j37_i1 );
    Y(241) = 0.0 - ( e0_F_j39 * e0_z_i1 - e0_L_j39 * e0_x_j39_i1 - e0_V_j39 * e0_y_j39_i1 + e0_V_j40 * e0_y_j40_i1 +
e0_L_j38 * e0_x_j38_i1 );
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    Y(242) = 0.0 - ( e0_F_j40 * e0_z_i1 - e0_L_j40 * e0_x_j40_i1 - e0_V_j40 * e0_y_j40_i1 + e0_V_j41 * e0_y_j41_i1 +
e0_L_j39 * e0_x_j39_i1 );
    Y(243) = 0.0 - ( e0_F_j41 * e0_z_i1 - e0_L_j41 * e0_x_j41_i1 - e0_V_j41 * e0_y_j41_i1 + e0_V_j42 * e0_y_j42_i1 +
e0_L_j40 * e0_x_j40_i1 );
    Y(244) = 0.0 - ( e0_F_j42 * e0_z_i1 - e0_L_j42 * e0_x_j42_i1 - e0_V_j42 * e0_y_j42_i1 + e0_V_j43 * e0_y_j43_i1 +
e0_L_j41 * e0_x_j41_i1 );
    Y(245) = 0.0 - ( e0_F_j43 * e0_z_i1 - e0_L_j43 * e0_x_j43_i1 - e0_V_j43 * e0_y_j43_i1 + e0_V_j44 * e0_y_j44_i1 +
e0_L_j42 * e0_x_j42_i1 );
    Y(246) = 0.0 - ( e0_F_j44 * e0_z_i1 - e0_L_j44 * e0_x_j44_i1 - e0_V_j44 * e0_y_j44_i1 + e0_V_j45 * e0_y_j45_i1 +
e0_L_j43 * e0_x_j43_i1 );
    Y(247) = 0.0 - ( e0_F_j45 * e0_z_i1 - e0_L_j45 * e0_x_j45_i1 - e0_V_j45 * e0_y_j45_i1 + e0_V_j46 * e0_y_j46_i1 +
e0_L_j44 * e0_x_j44_i1 );
    Y(248) = 0.0 - ( e0_F_j46 * e0_z_i1 - e0_L_j46 * e0_x_j46_i1 - e0_V_j46 * e0_y_j46_i1 + e0_V_j47 * e0_y_j47_i1 +
e0_L_j45 * e0_x_j45_i1 );
    Y(249) = 0.0 - ( e0_F_j47 * e0_z_i1 - e0_L_j47 * e0_x_j47_i1 - e0_V_j47 * e0_y_j47_i1 + e0_V_j48 * e0_y_j48_i1 +
e0_L_j46 * e0_x_j46_i1 );
    Y(250) = 0.0 - ( e0_F_j48 * e0_z_i1 - e0_L_j48 * e0_x_j48_i1 - e0_V_j48 * e0_y_j48_i1 + e0_V_j49 * e0_y_j49_i1 +
e0_L_j47 * e0_x_j47_i1 );
    Y(251) = 0.0 - ( e0_F_j49 * e0_z_i1 - e0_L_j49 * e0_x_j49_i1 - e0_V_j49 * e0_y_j49_i1 + e0_V_j50 * e0_y_j50_i1 +
e0_L_j48 * e0_x_j48_i1 );
    Y(252) = 0.0 - ( e0_F_j1 * e0_z_i2 - e0_L_j1 * e0_x_j1_i2 - e0_V_j1 * e0_y_j1_i2 + e0_V_j2 * e0_y_j2_i2 + e0_L_j0
* e0_x_j0_i2 );
    Y(253) = 0.0 - ( e0_F_j2 * e0_z_i2 - e0_L_j2 * e0_x_j2_i2 - e0_V_j2 * e0_y_j2_i2 + e0_V_j3 * e0_y_j3_i2 + e0_L_j1
* e0_x_j1_i2 );
    Y(254) = 0.0 - ( e0_F_j3 * e0_z_i2 - e0_L_j3 * e0_x_j3_i2 - e0_V_j3 * e0_y_j3_i2 + e0_V_j4 * e0_y_j4_i2 + e0_L_j2
* e0_x_j2_i2 );
    Y(255) = 0.0 - ( e0_F_j4 * e0_z_i2 - e0_L_j4 * e0_x_j4_i2 - e0_V_j4 * e0_y_j4_i2 + e0_V_j5 * e0_y_j5_i2 + e0_L_j3
* e0_x_j3_i2 );
    Y(256) = 0.0 - ( e0_F_j5 * e0_z_i2 - e0_L_j5 * e0_x_j5_i2 - e0_V_j5 * e0_y_j5_i2 + e0_V_j6 * e0_y_j6_i2 + e0_L_j4
* e0_x_j4_i2 );
    Y(257) = 0.0 - ( e0_F_j6 * e0_z_i2 - e0_L_j6 * e0_x_j6_i2 - e0_V_j6 * e0_y_j6_i2 + e0_V_j7 * e0_y_j7_i2 + e0_L_j5
* e0_x_j5_i2 );
    Y(258) = 0.0 - ( e0_F_j7 * e0_z_i2 - e0_L_j7 * e0_x_j7_i2 - e0_V_j7 * e0_y_j7_i2 + e0_V_j8 * e0_y_j8_i2 + e0_L_j6
* e0_x_j6_i2 );
    Y(259) = 0.0 - ( e0_F_j8 * e0_z_i2 - e0_L_j8 * e0_x_j8_i2 - e0_V_j8 * e0_y_j8_i2 + e0_V_j9 * e0_y_j9_i2 + e0_L_j7
* e0_x_j7_i2 );
    Y(260) = 0.0 - ( e0_F_j9 * e0_z_i2 - e0_L_j9 * e0_x_j9_i2 - e0_V_j9 * e0_y_j9_i2 + e0_V_j10 * e0_y_j10_i2 +
e0_L_j8 * e0_x_j8_i2 );
    Y(261) = 0.0 - ( e0_F_j10 * e0_z_i2 - e0_L_j10 * e0_x_j10_i2 - e0_V_j10 * e0_y_j10_i2 + e0_V_j11 * e0_y_j11_i2 +
e0_L_j9 * e0_x_j9_i2 );
    Y(262) = 0.0 - ( e0_F_j11 * e0_z_i2 - e0_L_j11 * e0_x_j11_i2 - e0_V_j11 * e0_y_j11_i2 + e0_V_j12 * e0_y_j12_i2 +
e0_L_j10 * e0_x_j10_i2 );
    Y(263) = 0.0 - ( e0_F_j12 * e0_z_i2 - e0_L_j12 * e0_x_j12_i2 - e0_V_j12 * e0_y_j12_i2 + e0_V_j13 * e0_y_j13_i2 +
e0_L_j11 * e0_x_j11_i2 );
    Y(264) = 0.0 - ( e0_F_j13 * e0_z_i2 - e0_L_j13 * e0_x_j13_i2 - e0_V_j13 * e0_y_j13_i2 + e0_V_j14 * e0_y_j14_i2 +
e0_L_j12 * e0_x_j12_i2 );
    Y(265) = 0.0 - ( e0_F_j14 * e0_z_i2 - e0_L_j14 * e0_x_j14_i2 - e0_V_j14 * e0_y_j14_i2 + e0_V_j15 * e0_y_j15_i2 +
e0_L_j13 * e0_x_j13_i2 );
    Y(266) = 0.0 - ( e0_F_j15 * e0_z_i2 - e0_L_j15 * e0_x_j15_i2 - e0_V_j15 * e0_y_j15_i2 + e0_V_j16 * e0_y_j16_i2 +
e0_L_j14 * e0_x_j14_i2 );
    Y(267) = 0.0 - ( e0_F_j16 * e0_z_i2 - e0_L_j16 * e0_x_j16_i2 - e0_V_j16 * e0_y_j16_i2 + e0_V_j17 * e0_y_j17_i2 +
e0_L_j15 * e0_x_j15_i2 );
    Y(268) = 0.0 - ( e0_F_j17 * e0_z_i2 - e0_L_j17 * e0_x_j17_i2 - e0_V_j17 * e0_y_j17_i2 + e0_V_j18 * e0_y_j18_i2 +
e0_L_j16 * e0_x_j16_i2 );
    Y(269) = 0.0 - ( e0_F_j18 * e0_z_i2 - e0_L_j18 * e0_x_j18_i2 - e0_V_j18 * e0_y_j18_i2 + e0_V_j19 * e0_y_j19_i2 +
e0_L_j17 * e0_x_j17_i2 );
    Y(270) = 0.0 - ( e0_F_j19 * e0_z_i2 - e0_L_j19 * e0_x_j19_i2 - e0_V_j19 * e0_y_j19_i2 + e0_V_j20 * e0_y_j20_i2 +
e0_L_j18 * e0_x_j18_i2 );
    Y(271) = 0.0 - ( e0_F_j20 * e0_z_i2 - e0_L_j20 * e0_x_j20_i2 - e0_V_j20 * e0_y_j20_i2 + e0_V_j21 * e0_y_j21_i2 +
e0_L_j19 * e0_x_j19_i2 );
    Y(272) = 0.0 - ( e0_F_j21 * e0_z_i2 - e0_L_j21 * e0_x_j21_i2 - e0_V_j21 * e0_y_j21_i2 + e0_V_j22 * e0_y_j22_i2 +
e0_L_j20 * e0_x_j20_i2 );
    Y(273) = 0.0 - ( e0_F_j22 * e0_z_i2 - e0_L_j22 * e0_x_j22_i2 - e0_V_j22 * e0_y_j22_i2 + e0_V_j23 * e0_y_j23_i2 +
e0_L_j21 * e0_x_j21_i2 );
    Y(274) = 0.0 - ( e0_F_j23 * e0_z_i2 - e0_L_j23 * e0_x_j23_i2 - e0_V_j23 * e0_y_j23_i2 + e0_V_j24 * e0_y_j24_i2 +
e0_L_j22 * e0_x_j22_i2 );
    Y(275) = 0.0 - ( e0_F_j24 * e0_z_i2 - e0_L_j24 * e0_x_j24_i2 - e0_V_j24 * e0_y_j24_i2 + e0_V_j25 * e0_y_j25_i2 +
e0_L_j23 * e0_x_j23_i2 );
    Y(276) = 0.0 - ( e0_F_j25 * e0_z_i2 - e0_L_j25 * e0_x_j25_i2 - e0_V_j25 * e0_y_j25_i2 + e0_V_j26 * e0_y_j26_i2 +
e0_L_j24 * e0_x_j24_i2 );
    Y(277) = 0.0 - ( e0_F_j26 * e0_z_i2 - e0_L_j26 * e0_x_j26_i2 - e0_V_j26 * e0_y_j26_i2 + e0_V_j27 * e0_y_j27_i2 +
e0_L_j25 * e0_x_j25_i2 );
    Y(278) = 0.0 - ( e0_F_j27 * e0_z_i2 - e0_L_j27 * e0_x_j27_i2 - e0_V_j27 * e0_y_j27_i2 + e0_V_j28 * e0_y_j28_i2 +
e0_L_j26 * e0_x_j26_i2 );
    Y(279) = 0.0 - ( e0_F_j28 * e0_z_i2 - e0_L_j28 * e0_x_j28_i2 - e0_V_j28 * e0_y_j28_i2 + e0_V_j29 * e0_y_j29_i2 +
e0_L_j27 * e0_x_j27_i2 );
    Y(280) = 0.0 - ( e0_F_j29 * e0_z_i2 - e0_L_j29 * e0_x_j29_i2 - e0_V_j29 * e0_y_j29_i2 + e0_V_j30 * e0_y_j30_i2 +
e0_L_j28 * e0_x_j28_i2 );
    Y(281) = 0.0 - ( e0_F_j30 * e0_z_i2 - e0_L_j30 * e0_x_j30_i2 - e0_V_j30 * e0_y_j30_i2 + e0_V_j31 * e0_y_j31_i2 +
e0_L_j29 * e0_x_j29_i2 );
    Y(282) = 0.0 - ( e0_F_j31 * e0_z_i2 - e0_L_j31 * e0_x_j31_i2 - e0_V_j31 * e0_y_j31_i2 + e0_V_j32 * e0_y_j32_i2 +
e0_L_j30 * e0_x_j30_i2 );
    Y(283) = 0.0 - ( e0_F_j32 * e0_z_i2 - e0_L_j32 * e0_x_j32_i2 - e0_V_j32 * e0_y_j32_i2 + e0_V_j33 * e0_y_j33_i2 +
e0_L_j31 * e0_x_j31_i2 );
    Y(284) = 0.0 - ( e0_F_j33 * e0_z_i2 - e0_L_j33 * e0_x_j33_i2 - e0_V_j33 * e0_y_j33_i2 + e0_V_j34 * e0_y_j34_i2 +
e0_L_j32 * e0_x_j32_i2 );
    Y(285) = 0.0 - ( e0_F_j34 * e0_z_i2 - e0_L_j34 * e0_x_j34_i2 - e0_V_j34 * e0_y_j34_i2 + e0_V_j35 * e0_y_j35_i2 +
e0_L_j33 * e0_x_j33_i2 );
    Y(286) = 0.0 - ( e0_F_j35 * e0_z_i2 - e0_L_j35 * e0_x_j35_i2 - e0_V_j35 * e0_y_j35_i2 + e0_V_j36 * e0_y_j36_i2 +
e0_L_j34 * e0_x_j34_i2 );
    Y(287) = 0.0 - ( e0_F_j36 * e0_z_i2 - e0_L_j36 * e0_x_j36_i2 - e0_V_j36 * e0_y_j36_i2 + e0_V_j37 * e0_y_j37_i2 +
e0_L_j35 * e0_x_j35_i2 );
    Y(288) = 0.0 - ( e0_F_j37 * e0_z_i2 - e0_L_j37 * e0_x_j37_i2 - e0_V_j37 * e0_y_j37_i2 + e0_V_j38 * e0_y_j38_i2 +
e0_L_j36 * e0_x_j36_i2 );
    Y(289) = 0.0 - ( e0_F_j38 * e0_z_i2 - e0_L_j38 * e0_x_j38_i2 - e0_V_j38 * e0_y_j38_i2 + e0_V_j39 * e0_y_j39_i2 +
e0_L_j37 * e0_x_j37_i2 );
    Y(290) = 0.0 - ( e0_F_j39 * e0_z_i2 - e0_L_j39 * e0_x_j39_i2 - e0_V_j39 * e0_y_j39_i2 + e0_V_j40 * e0_y_j40_i2 +
e0_L_j38 * e0_x_j38_i2 );
    Y(291) = 0.0 - ( e0_F_j40 * e0_z_i2 - e0_L_j40 * e0_x_j40_i2 - e0_V_j40 * e0_y_j40_i2 + e0_V_j41 * e0_y_j41_i2 +
e0_L_j39 * e0_x_j39_i2 );
    Y(292) = 0.0 - ( e0_F_j41 * e0_z_i2 - e0_L_j41 * e0_x_j41_i2 - e0_V_j41 * e0_y_j41_i2 + e0_V_j42 * e0_y_j42_i2 +
e0_L_j40 * e0_x_j40_i2 );
```

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    Y(293) = 0.0 - ( e0_F_j42 * e0_z_i2 - e0_L_j42 * e0_x_j42_i2 - e0_V_j42 * e0_y_j42_i2 + e0_V_j43 * e0_y_j43_i2 +
e0_L_j41 * e0_x_j41_i2 );
    Y(294) = 0.0 - ( e0_F_j43 * e0_z_i2 - e0_L_j43 * e0_x_j43_i2 - e0_V_j43 * e0_y_j43_i2 + e0_V_j44 * e0_y_j44_i2 +
e0_L_j42 * e0_x_j42_i2 );
    Y(295) = 0.0 - ( e0_F_j44 * e0_z_i2 - e0_L_j44 * e0_x_j44_i2 - e0_V_j44 * e0_y_j44_i2 + e0_V_j45 * e0_y_j45_i2 +
e0_L_j43 * e0_x_j43_i2 );
    Y(296) = 0.0 - ( e0_F_j45 * e0_z_i2 - e0_L_j45 * e0_x_j45_i2 - e0_V_j45 * e0_y_j45_i2 + e0_V_j46 * e0_y_j46_i2 +
e0_L_j44 * e0_x_j44_i2 );
    Y(297) = 0.0 - ( e0_F_j46 * e0_z_i2 - e0_L_j46 * e0_x_j46_i2 - e0_V_j46 * e0_y_j46_i2 + e0_V_j47 * e0_y_j47_i2 +
e0_L_j45 * e0_x_j45_i2 );
    Y(298) = 0.0 - ( e0_F_j47 * e0_z_i2 - e0_L_j47 * e0_x_j47_i2 - e0_V_j47 * e0_y_j47_i2 + e0_V_j48 * e0_y_j48_i2 +
e0_L_j46 * e0_x_j46_i2 );
    Y(299) = 0.0 - ( e0_F_j48 * e0_z_i2 - e0_L_j48 * e0_x_j48_i2 - e0_V_j48 * e0_y_j48_i2 + e0_V_j49 * e0_y_j49_i2 +
e0_L_j47 * e0_x_j47_i2 );
    Y(300) = 0.0 - ( e0_F_j49 * e0_z_i2 - e0_L_j49 * e0_x_j49_i2 - e0_V_j49 * e0_y_j49_i2 + e0_V_j50 * e0_y_j50_i2 +
e0_L_j48 * e0_x_j48_i2 );
    Y(301) = e0_V_j1 * e0_h_V_j1 - ( e0_h_L_j0 * ( e0_L_j0 + e0_D_c ) + e0_Q_c );
    Y(302) = ( e0_y_j49_i1 + e0_y_j49_i2 ) - ( 1.0 );
    Y(303) = e0_B_r * e0_x_j49_i1 - ( e0_L_j48 * e0_x_j48_i1 - e0_V_j49 * e0_y_j49_i1 );
    Y(304) = e0_B_r * e0_x_j49_i2 - ( e0_L_j48 * e0_x_j48_i2 - e0_V_j49 * e0_y_j49_i2 );
    Y(305) = e0_V_j1 - ( e0_L_j0 + e0_D_c );
    Y(306) = ( e0_x_j1_i1 + e0_x_j1_i2 ) - ( 1.0 );
    Y(307) = ( e0_x_j2_i1 + e0_x_j2_i2 ) - ( 1.0 );
    Y(308) = ( e0_x_j3_i1 + e0_x_j3_i2 ) - ( 1.0 );
    Y(309) = ( e0_x_j4_i1 + e0_x_j4_i2 ) - ( 1.0 );
    Y(310) = ( e0_x_j5_i1 + e0_x_j5_i2 ) - ( 1.0 );
    Y(311) = ( e0_x_j6_i1 + e0_x_j6_i2 ) - ( 1.0 );
    Y(312) = ( e0_x_j7_i1 + e0_x_j7_i2 ) - ( 1.0 );
    Y(313) = ( e0_x_j8_i1 + e0_x_j8_i2 ) - ( 1.0 );
    Y(314) = ( e0_x_j9_i1 + e0_x_j9_i2 ) - ( 1.0 );
    Y(315) = ( e0_x_j10_i1 + e0_x_j10_i2 ) - ( 1.0 );
    Y(316) = ( e0_x_j11_i1 + e0_x_j11_i2 ) - ( 1.0 );
    Y(317) = ( e0_x_j12_i1 + e0_x_j12_i2 ) - ( 1.0 );
    Y(318) = ( e0_x_j13_i1 + e0_x_j13_i2 ) - ( 1.0 );
    Y(319) = ( e0_x_j14_i1 + e0_x_j14_i2 ) - ( 1.0 );
    Y(320) = ( e0_x_j15_i1 + e0_x_j15_i2 ) - ( 1.0 );
    Y(321) = ( e0_x_j16_i1 + e0_x_j16_i2 ) - ( 1.0 );
    Y(322) = ( e0_x_j17_i1 + e0_x_j17_i2 ) - ( 1.0 );
    Y(323) = ( e0_x_j18_i1 + e0_x_j18_i2 ) - ( 1.0 );
    Y(324) = ( e0_x_j19_i1 + e0_x_j19_i2 ) - ( 1.0 );
    Y(325) = ( e0_x_j20_i1 + e0_x_j20_i2 ) - ( 1.0 );
    Y(326) = ( e0_x_j21_i1 + e0_x_j21_i2 ) - ( 1.0 );
    Y(327) = ( e0_x_j22_i1 + e0_x_j22_i2 ) - ( 1.0 );
    Y(328) = ( e0_x_j23_i1 + e0_x_j23_i2 ) - ( 1.0 );
    Y(329) = ( e0_x_j24_i1 + e0_x_j24_i2 ) - ( 1.0 );
    Y(330) = ( e0_x_j25_i1 + e0_x_j25_i2 ) - ( 1.0 );
    Y(331) = ( e0_x_j26_i1 + e0_x_j26_i2 ) - ( 1.0 );
    Y(332) = ( e0_x_j27_i1 + e0_x_j27_i2 ) - ( 1.0 );
    Y(333) = ( e0_x_j28_i1 + e0_x_j28_i2 ) - ( 1.0 );
    Y(334) = ( e0_x_j29_i1 + e0_x_j29_i2 ) - ( 1.0 );
    Y(335) = ( e0_x_j30_i1 + e0_x_j30_i2 ) - ( 1.0 );
    Y(336) = ( e0_x_j31_i1 + e0_x_j31_i2 ) - ( 1.0 );
    Y(337) = ( e0_x_j32_i1 + e0_x_j32_i2 ) - ( 1.0 );
    Y(338) = ( e0_x_j33_i1 + e0_x_j33_i2 ) - ( 1.0 );
    Y(339) = ( e0_x_j34_i1 + e0_x_j34_i2 ) - ( 1.0 );
    Y(340) = ( e0_x_j35_i1 + e0_x_j35_i2 ) - ( 1.0 );
    Y(341) = ( e0_x_j36_i1 + e0_x_j36_i2 ) - ( 1.0 );
    Y(342) = ( e0_x_j37_i1 + e0_x_j37_i2 ) - ( 1.0 );
    Y(343) = ( e0_x_j38_i1 + e0_x_j38_i2 ) - ( 1.0 );
    Y(344) = ( e0_x_j39_i1 + e0_x_j39_i2 ) - ( 1.0 );
    Y(345) = ( e0_x_j40_i1 + e0_x_j40_i2 ) - ( 1.0 );
    Y(346) = ( e0_x_j41_i1 + e0_x_j41_i2 ) - ( 1.0 );
    Y(347) = ( e0_x_j42_i1 + e0_x_j42_i2 ) - ( 1.0 );
    Y(348) = ( e0_x_j43_i1 + e0_x_j43_i2 ) - ( 1.0 );
    Y(349) = ( e0_x_j44_i1 + e0_x_j44_i2 ) - ( 1.0 );
    Y(350) = ( e0_x_j45_i1 + e0_x_j45_i2 ) - ( 1.0 );
    Y(351) = ( e0_x_j46_i1 + e0_x_j46_i2 ) - ( 1.0 );
    Y(352) = ( e0_x_j47_i1 + e0_x_j47_i2 ) - ( 1.0 );
    Y(353) = ( e0_x_j48_i1 + e0_x_j48_i2 ) - ( 1.0 );
    Y(354) = ( e0_x_j49_i1 + e0_x_j49_i2 ) - ( 1.0 );
    Y(355) = ( e0_x_j49_i1 + e0_x_j49_i2 ) - ( 1.0 );


end

function[std_h_L] = fun_47217__function(std_h_l_i1,std_h_l_i2,std_x_i1,std_x_i2)
    std_h_L = std_h_l_i1 * std_x_i1 + std_h_l_i2 * std_x_i2 ;
end

function[std_P_o] = fun_47218__function(std_T,std_C,std_B,std_A)
    std_P_o = 100000.0 * exp( std_A + ( std_B )/( std_T + std_C ) ) ;
end

function[std_K] = fun_47167__function(std_greek_gamma,std_P_o,std_P,std_greek_phi)
    std_K = ( std_P_o * std_greek_gamma )/( std_P * std_greek_phi ) ;
end

function[std_h_V] = fun_47202__function(std_h_v_i1,std_h_v_i2,std_y_i1,std_y_i2)
    std_h_V = std_h_v_i1 * std_y_i1 + std_h_v_i2 * std_y_i2 ;
end

function[std_h_v] = fun_47210__function(std_T,std_greek_lambda_b,std_A_L,std_B_L,std_C_L,std_T_b,std_T_c)
    std_h_v = ( std_A_L * std_T + ( std_B_L )/( 2.0 ) * ( ( std_T ) )^( 2.0 ) + ( std_C_L )/( 3.0 ) * ( ( std_T ) )^(
3.0 ) ) - ( std_A_L * 298.0 + ( std_B_L )/( 2.0 ) * ( ( 298.0 ) )^( 2.0 ) + ( std_C_L )/( 3.0 ) * ( ( 298.0 ) )^( 3.0
) ) + std_greek_lambda_b * ( ( ( std_T_c - std_T )/( std_T_c - std_T_b ) ) )^( 0.38 ) ;
end

function[std_h_l] = fun_47216__function(std_T,std_C_L,std_B_L,std_A_L)
    std_h_l = ( std_A_L * std_T + ( std_B_L )/( 2.0 ) * ( ( std_T ) )^( 2.0 ) + ( std_C_L )/( 3.0 ) * ( ( std_T ) )^(
3.0 ) ) - ( std_A_L * 298.0 + ( std_B_L )/( 2.0 ) * ( ( 298.0 ) )^( 2.0 ) + ( std_C_L )/( 3.0 ) * ( ( 298.0 ) )^( 3.0
) ) ;
end
```

```
function[] = displayResults(X_ITER)

    % print variable values to display
    disp(['e0_B_r  ', num2str(X_ITER(1))]);
    disp(['e0_D_c  ', num2str(X_ITER(2))]);
    disp(['e0_L_j0  ', num2str(X_ITER(3))]);
    disp(['e0_L_j10  ', num2str(X_ITER(4))]);
    disp(['e0_L_j11  ', num2str(X_ITER(5))]);
    disp(['e0_L_j12  ', num2str(X_ITER(6))]);
    disp(['e0_L_j13  ', num2str(X_ITER(7))]);
    disp(['e0_L_j14  ', num2str(X_ITER(8))]);
    disp(['e0_L_j15  ', num2str(X_ITER(9))]);
    disp(['e0_L_j16  ', num2str(X_ITER(10))]);
    disp(['e0_L_j17  ', num2str(X_ITER(11))]);
    disp(['e0_L_j18  ', num2str(X_ITER(12))]);
    disp(['e0_L_j19  ', num2str(X_ITER(13))]);
    disp(['e0_L_j1  ', num2str(X_ITER(14))]);
    disp(['e0_L_j20  ', num2str(X_ITER(15))]);
    disp(['e0_L_j21  ', num2str(X_ITER(16))]);
    disp(['e0_L_j22  ', num2str(X_ITER(17))]);
    disp(['e0_L_j23  ', num2str(X_ITER(18))]);
    disp(['e0_L_j24  ', num2str(X_ITER(19))]);
    disp(['e0_L_j25  ', num2str(X_ITER(20))]);
    disp(['e0_L_j26  ', num2str(X_ITER(21))]);
    disp(['e0_L_j27  ', num2str(X_ITER(22))]);
    disp(['e0_L_j28  ', num2str(X_ITER(23))]);
    disp(['e0_L_j29  ', num2str(X_ITER(24))]);
    disp(['e0_L_j2  ', num2str(X_ITER(25))]);
    disp(['e0_L_j30  ', num2str(X_ITER(26))]);
    disp(['e0_L_j31  ', num2str(X_ITER(27))]);
    disp(['e0_L_j32  ', num2str(X_ITER(28))]);
    disp(['e0_L_j33  ', num2str(X_ITER(29))]);
    disp(['e0_L_j34  ', num2str(X_ITER(30))]);
    disp(['e0_L_j35  ', num2str(X_ITER(31))]);
    disp(['e0_L_j36  ', num2str(X_ITER(32))]);
    disp(['e0_L_j37  ', num2str(X_ITER(33))]);
    disp(['e0_L_j38  ', num2str(X_ITER(34))]);
    disp(['e0_L_j39  ', num2str(X_ITER(35))]);
    disp(['e0_L_j3  ', num2str(X_ITER(36))]);
    disp(['e0_L_j40  ', num2str(X_ITER(37))]);
    disp(['e0_L_j41  ', num2str(X_ITER(38))]);
    disp(['e0_L_j42  ', num2str(X_ITER(39))]);
    disp(['e0_L_j43  ', num2str(X_ITER(40))]);
    disp(['e0_L_j44  ', num2str(X_ITER(41))]);
    disp(['e0_L_j45  ', num2str(X_ITER(42))]);
    disp(['e0_L_j46  ', num2str(X_ITER(43))]);
    disp(['e0_L_j47  ', num2str(X_ITER(44))]);
    disp(['e0_L_j48  ', num2str(X_ITER(45))]);
    disp(['e0_L_j49  ', num2str(X_ITER(46))]);
    disp(['e0_L_j4  ', num2str(X_ITER(47))]);
    disp(['e0_L_j5  ', num2str(X_ITER(48))]);
    disp(['e0_L_j6  ', num2str(X_ITER(49))]);
    disp(['e0_L_j7  ', num2str(X_ITER(50))]);
    disp(['e0_L_j8  ', num2str(X_ITER(51))]);
    disp(['e0_L_j9  ', num2str(X_ITER(52))]);
    disp(['e0_Q_c  ', num2str(X_ITER(53))]);
    disp(['e0_T_j0  ', num2str(X_ITER(54))]);
    disp(['e0_T_j10  ', num2str(X_ITER(55))]);
    disp(['e0_T_j11  ', num2str(X_ITER(56))]);
    disp(['e0_T_j12  ', num2str(X_ITER(57))]);
    disp(['e0_T_j13  ', num2str(X_ITER(58))]);
    disp(['e0_T_j14  ', num2str(X_ITER(59))]);
    disp(['e0_T_j15  ', num2str(X_ITER(60))]);
    disp(['e0_T_j16  ', num2str(X_ITER(61))]);
    disp(['e0_T_j17  ', num2str(X_ITER(62))]);
    disp(['e0_T_j18  ', num2str(X_ITER(63))]);
    disp(['e0_T_j19  ', num2str(X_ITER(64))]);
    disp(['e0_T_j1  ', num2str(X_ITER(65))]);
    disp(['e0_T_j20  ', num2str(X_ITER(66))]);
    disp(['e0_T_j21  ', num2str(X_ITER(67))]);
    disp(['e0_T_j22  ', num2str(X_ITER(68))]);
    disp(['e0_T_j23  ', num2str(X_ITER(69))]);
    disp(['e0_T_j24  ', num2str(X_ITER(70))]);
    disp(['e0_T_j25  ', num2str(X_ITER(71))]);
    disp(['e0_T_j26  ', num2str(X_ITER(72))]);
    disp(['e0_T_j27  ', num2str(X_ITER(73))]);
    disp(['e0_T_j28  ', num2str(X_ITER(74))]);
    disp(['e0_T_j29  ', num2str(X_ITER(75))]);
    disp(['e0_T_j2  ', num2str(X_ITER(76))]);
    disp(['e0_T_j30  ', num2str(X_ITER(77))]);
    disp(['e0_T_j31  ', num2str(X_ITER(78))]);
    disp(['e0_T_j32  ', num2str(X_ITER(79))]);
    disp(['e0_T_j33  ', num2str(X_ITER(80))]);
    disp(['e0_T_j34  ', num2str(X_ITER(81))]);
    disp(['e0_T_j35  ', num2str(X_ITER(82))]);
    disp(['e0_T_j36  ', num2str(X_ITER(83))]);
    disp(['e0_T_j37  ', num2str(X_ITER(84))]);
    disp(['e0_T_j38  ', num2str(X_ITER(85))]);
    disp(['e0_T_j39  ', num2str(X_ITER(86))]);
    disp(['e0_T_j3  ', num2str(X_ITER(87))]);
    disp(['e0_T_j40  ', num2str(X_ITER(88))]);
    disp(['e0_T_j41  ', num2str(X_ITER(89))]);
    disp(['e0_T_j42  ', num2str(X_ITER(90))]);
    disp(['e0_T_j43  ', num2str(X_ITER(91))]);
    disp(['e0_T_j44  ', num2str(X_ITER(92))]);
    disp(['e0_T_j45  ', num2str(X_ITER(93))]);
    disp(['e0_T_j46  ', num2str(X_ITER(94))]);
    disp(['e0_T_j47  ', num2str(X_ITER(95))]);
    disp(['e0_T_j48  ', num2str(X_ITER(96))]);
    disp(['e0_T_j49  ', num2str(X_ITER(97))]);
    disp(['e0_T_j4  ', num2str(X_ITER(98))]);
    disp(['e0_T_j5  ', num2str(X_ITER(99))]);
```

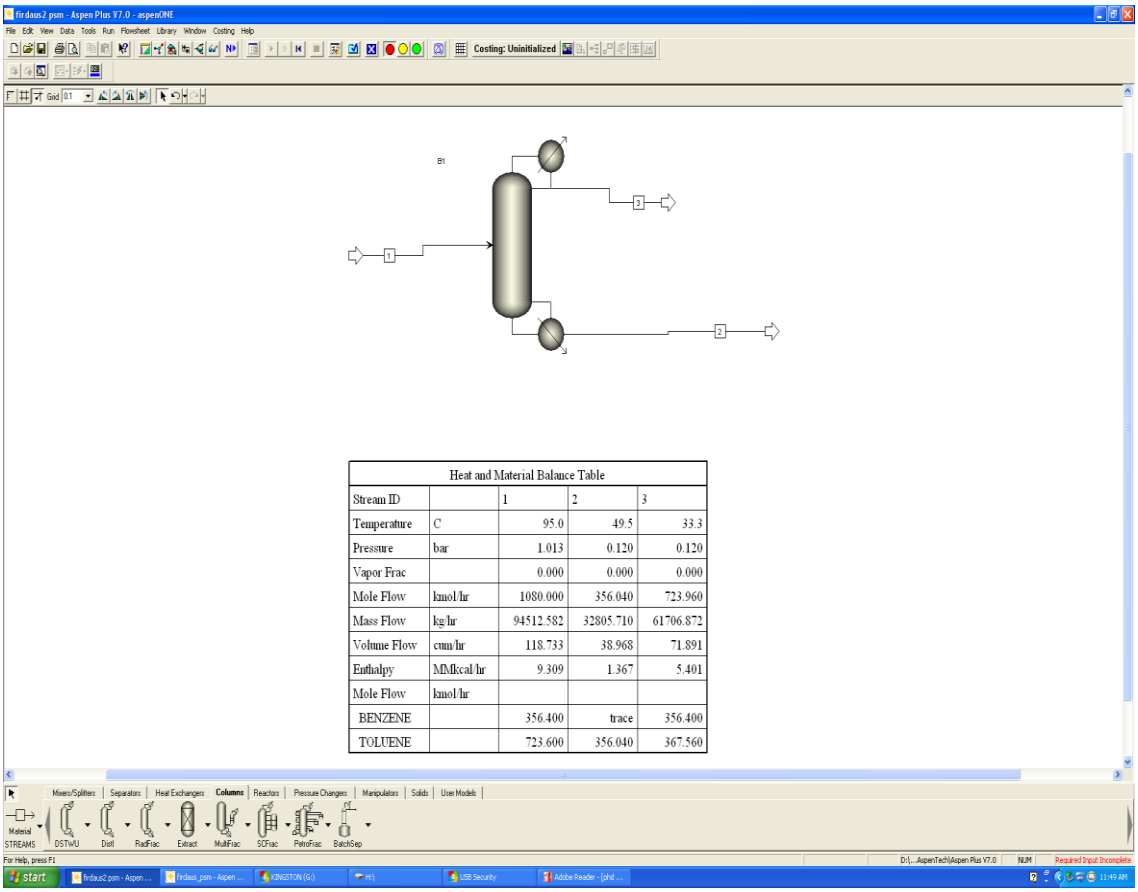
```
disp(['e0_T_j6  ', num2str(X_ITER(100))]);
disp(['e0_T_j7  ', num2str(X_ITER(101))]);
disp(['e0_T_j8  ', num2str(X_ITER(102))]);
disp(['e0_T_j9  ', num2str(X_ITER(103))]);
disp(['e0_V_j10  ', num2str(X_ITER(104))]);
disp(['e0_V_j11  ', num2str(X_ITER(105))]);
disp(['e0_V_j12  ', num2str(X_ITER(106))]);
disp(['e0_V_j13  ', num2str(X_ITER(107))]);
disp(['e0_V_j14  ', num2str(X_ITER(108))]);
disp(['e0_V_j15  ', num2str(X_ITER(109))]);
disp(['e0_V_j16  ', num2str(X_ITER(110))]);
disp(['e0_V_j17  ', num2str(X_ITER(111))]);
disp(['e0_V_j18  ', num2str(X_ITER(112))]);
disp(['e0_V_j19  ', num2str(X_ITER(113))]);
disp(['e0_V_j1  ', num2str(X_ITER(114))]);
disp(['e0_V_j20  ', num2str(X_ITER(115))]);
disp(['e0_V_j21  ', num2str(X_ITER(116))]);
disp(['e0_V_j22  ', num2str(X_ITER(117))]);
disp(['e0_V_j23  ', num2str(X_ITER(118))]);
disp(['e0_V_j24  ', num2str(X_ITER(119))]);
disp(['e0_V_j25  ', num2str(X_ITER(120))]);
disp(['e0_V_j26  ', num2str(X_ITER(121))]);
disp(['e0_V_j27  ', num2str(X_ITER(122))]);
disp(['e0_V_j28  ', num2str(X_ITER(123))]);
disp(['e0_V_j29  ', num2str(X_ITER(124))]);
disp(['e0_V_j2  ', num2str(X_ITER(125))]);
disp(['e0_V_j30  ', num2str(X_ITER(126))]);
disp(['e0_V_j31  ', num2str(X_ITER(127))]);
disp(['e0_V_j32  ', num2str(X_ITER(128))]);
disp(['e0_V_j33  ', num2str(X_ITER(129))]);
disp(['e0_V_j34  ', num2str(X_ITER(130))]);
disp(['e0_V_j35  ', num2str(X_ITER(131))]);
disp(['e0_V_j36  ', num2str(X_ITER(132))]);
disp(['e0_V_j37  ', num2str(X_ITER(133))]);
disp(['e0_V_j38  ', num2str(X_ITER(134))]);
disp(['e0_V_j39  ', num2str(X_ITER(135))]);
disp(['e0_V_j3  ', num2str(X_ITER(136))]);
disp(['e0_V_j40  ', num2str(X_ITER(137))]);
disp(['e0_V_j41  ', num2str(X_ITER(138))]);
disp(['e0_V_j42  ', num2str(X_ITER(139))]);
disp(['e0_V_j43  ', num2str(X_ITER(140))]);
disp(['e0_V_j44  ', num2str(X_ITER(141))]);
disp(['e0_V_j45  ', num2str(X_ITER(142))]);
disp(['e0_V_j46  ', num2str(X_ITER(143))]);
disp(['e0_V_j47  ', num2str(X_ITER(144))]);
disp(['e0_V_j48  ', num2str(X_ITER(145))]);
disp(['e0_V_j49  ', num2str(X_ITER(146))]);
disp(['e0_V_j4  ', num2str(X_ITER(147))]);
disp(['e0_V_j50  ', num2str(X_ITER(148))]);
disp(['e0_V_j5  ', num2str(X_ITER(149))]);
disp(['e0_V_j6  ', num2str(X_ITER(150))]);
disp(['e0_V_j7  ', num2str(X_ITER(151))]);
disp(['e0_V_j8  ', num2str(X_ITER(152))]);
disp(['e0_V_j9  ', num2str(X_ITER(153))]);
disp(['e0_h_F  ', num2str(X_ITER(154))]);
disp(['e0_h_V_j50  ', num2str(X_ITER(155))]);
disp(['e0_x_j0_i1  ', num2str(X_ITER(156))]);
disp(['e0_x_j0_i2  ', num2str(X_ITER(157))]);
disp(['e0_x_j1_i1  ', num2str(X_ITER(158))]);
disp(['e0_x_j1_i2  ', num2str(X_ITER(159))]);
disp(['e0_x_j10_i1  ', num2str(X_ITER(160))]);
disp(['e0_x_j10_i2  ', num2str(X_ITER(161))]);
disp(['e0_x_j11_i1  ', num2str(X_ITER(162))]);
disp(['e0_x_j11_i2  ', num2str(X_ITER(163))]);
disp(['e0_x_j12_i1  ', num2str(X_ITER(164))]);
disp(['e0_x_j12_i2  ', num2str(X_ITER(165))]);
disp(['e0_x_j13_i1  ', num2str(X_ITER(166))]);
disp(['e0_x_j13_i2  ', num2str(X_ITER(167))]);
disp(['e0_x_j14_i1  ', num2str(X_ITER(168))]);
disp(['e0_x_j14_i2  ', num2str(X_ITER(169))]);
disp(['e0_x_j15_i1  ', num2str(X_ITER(170))]);
disp(['e0_x_j15_i2  ', num2str(X_ITER(171))]);
disp(['e0_x_j16_i1  ', num2str(X_ITER(172))]);
disp(['e0_x_j16_i2  ', num2str(X_ITER(173))]);
disp(['e0_x_j17_i1  ', num2str(X_ITER(174))]);
disp(['e0_x_j17_i2  ', num2str(X_ITER(175))]);
disp(['e0_x_j18_i1  ', num2str(X_ITER(176))]);
disp(['e0_x_j18_i2  ', num2str(X_ITER(177))]);
disp(['e0_x_j19_i1  ', num2str(X_ITER(178))]);
disp(['e0_x_j19_i2  ', num2str(X_ITER(179))]);
disp(['e0_x_j2_i1  ', num2str(X_ITER(180))]);
disp(['e0_x_j2_i2  ', num2str(X_ITER(181))]);
disp(['e0_x_j20_i1  ', num2str(X_ITER(182))]);
disp(['e0_x_j20_i2  ', num2str(X_ITER(183))]);
disp(['e0_x_j21_i1  ', num2str(X_ITER(184))]);
disp(['e0_x_j21_i2  ', num2str(X_ITER(185))]);
disp(['e0_x_j22_i1  ', num2str(X_ITER(186))]);
disp(['e0_x_j22_i2  ', num2str(X_ITER(187))]);
disp(['e0_x_j23_i1  ', num2str(X_ITER(188))]);
disp(['e0_x_j23_i2  ', num2str(X_ITER(189))]);
disp(['e0_x_j24_i1  ', num2str(X_ITER(190))]);
disp(['e0_x_j24_i2  ', num2str(X_ITER(191))]);
disp(['e0_x_j25_i1  ', num2str(X_ITER(192))]);
disp(['e0_x_j25_i2  ', num2str(X_ITER(193))]);
disp(['e0_x_j26_i1  ', num2str(X_ITER(194))]);
disp(['e0_x_j26_i2  ', num2str(X_ITER(195))]);
disp(['e0_x_j27_i1  ', num2str(X_ITER(196))]);
disp(['e0_x_j27_i2  ', num2str(X_ITER(197))]);
disp(['e0_x_j28_i1  ', num2str(X_ITER(198))]);
disp(['e0_x_j28_i2  ', num2str(X_ITER(199))]);
disp(['e0_x_j29_i1  ', num2str(X_ITER(200))]);
disp(['e0_x_j29_i2  ', num2str(X_ITER(201))]);
disp(['e0_x_j3_i1  ', num2str(X_ITER(202))]);
```

```
disp(['e0_x_j3_i2  ', num2str(X_ITER(203))]);
disp(['e0_x_j30_i1  ', num2str(X_ITER(204))]);
disp(['e0_x_j30_i2  ', num2str(X_ITER(205))]);
disp(['e0_x_j31_i1  ', num2str(X_ITER(206))]);
disp(['e0_x_j31_i2  ', num2str(X_ITER(207))]);
disp(['e0_x_j32_i1  ', num2str(X_ITER(208))]);
disp(['e0_x_j32_i2  ', num2str(X_ITER(209))]);
disp(['e0_x_j33_i1  ', num2str(X_ITER(210))]);
disp(['e0_x_j33_i2  ', num2str(X_ITER(211))]);
disp(['e0_x_j34_i1  ', num2str(X_ITER(212))]);
disp(['e0_x_j34_i2  ', num2str(X_ITER(213))]);
disp(['e0_x_j35_i1  ', num2str(X_ITER(214))]);
disp(['e0_x_j35_i2  ', num2str(X_ITER(215))]);
disp(['e0_x_j36_i1  ', num2str(X_ITER(216))]);
disp(['e0_x_j36_i2  ', num2str(X_ITER(217))]);
disp(['e0_x_j37_i1  ', num2str(X_ITER(218))]);
disp(['e0_x_j37_i2  ', num2str(X_ITER(219))]);
disp(['e0_x_j38_i1  ', num2str(X_ITER(220))]);
disp(['e0_x_j38_i2  ', num2str(X_ITER(221))]);
disp(['e0_x_j39_i1  ', num2str(X_ITER(222))]);
disp(['e0_x_j39_i2  ', num2str(X_ITER(223))]);
disp(['e0_x_j4_i1  ', num2str(X_ITER(224))]);
disp(['e0_x_j4_i2  ', num2str(X_ITER(225))]);
disp(['e0_x_j40_i1  ', num2str(X_ITER(226))]);
disp(['e0_x_j40_i2  ', num2str(X_ITER(227))]);
disp(['e0_x_j41_i1  ', num2str(X_ITER(228))]);
disp(['e0_x_j41_i2  ', num2str(X_ITER(229))]);
disp(['e0_x_j42_i1  ', num2str(X_ITER(230))]);
disp(['e0_x_j42_i2  ', num2str(X_ITER(231))]);
disp(['e0_x_j43_i1  ', num2str(X_ITER(232))]);
disp(['e0_x_j43_i2  ', num2str(X_ITER(233))]);
disp(['e0_x_j44_i1  ', num2str(X_ITER(234))]);
disp(['e0_x_j44_i2  ', num2str(X_ITER(235))]);
disp(['e0_x_j45_i1  ', num2str(X_ITER(236))]);
disp(['e0_x_j45_i2  ', num2str(X_ITER(237))]);
disp(['e0_x_j46_i1  ', num2str(X_ITER(238))]);
disp(['e0_x_j46_i2  ', num2str(X_ITER(239))]);
disp(['e0_x_j47_i1  ', num2str(X_ITER(240))]);
disp(['e0_x_j47_i2  ', num2str(X_ITER(241))]);
disp(['e0_x_j48_i1  ', num2str(X_ITER(242))]);
disp(['e0_x_j48_i2  ', num2str(X_ITER(243))]);
disp(['e0_x_j49_i1  ', num2str(X_ITER(244))]);
disp(['e0_x_j49_i2  ', num2str(X_ITER(245))]);
disp(['e0_x_j5_i1  ', num2str(X_ITER(246))]);
disp(['e0_x_j5_i2  ', num2str(X_ITER(247))]);
disp(['e0_x_j6_i1  ', num2str(X_ITER(248))]);
disp(['e0_x_j6_i2  ', num2str(X_ITER(249))]);
disp(['e0_x_j7_i1  ', num2str(X_ITER(250))]);
disp(['e0_x_j7_i2  ', num2str(X_ITER(251))]);
disp(['e0_x_j8_i1  ', num2str(X_ITER(252))]);
disp(['e0_x_j8_i2  ', num2str(X_ITER(253))]);
disp(['e0_x_j9_i1  ', num2str(X_ITER(254))]);
disp(['e0_x_j9_i2  ', num2str(X_ITER(255))]);
disp(['e0_y_j1_i1  ', num2str(X_ITER(256))]);
disp(['e0_y_j1_i2  ', num2str(X_ITER(257))]);
disp(['e0_y_j10_i1  ', num2str(X_ITER(258))]);
disp(['e0_y_j10_i2  ', num2str(X_ITER(259))]);
disp(['e0_y_j11_i1  ', num2str(X_ITER(260))]);
disp(['e0_y_j11_i2  ', num2str(X_ITER(261))]);
disp(['e0_y_j12_i1  ', num2str(X_ITER(262))]);
disp(['e0_y_j12_i2  ', num2str(X_ITER(263))]);
disp(['e0_y_j13_i1  ', num2str(X_ITER(264))]);
disp(['e0_y_j13_i2  ', num2str(X_ITER(265))]);
disp(['e0_y_j14_i1  ', num2str(X_ITER(266))]);
disp(['e0_y_j14_i2  ', num2str(X_ITER(267))]);
disp(['e0_y_j15_i1  ', num2str(X_ITER(268))]);
disp(['e0_y_j15_i2  ', num2str(X_ITER(269))]);
disp(['e0_y_j16_i1  ', num2str(X_ITER(270))]);
disp(['e0_y_j16_i2  ', num2str(X_ITER(271))]);
disp(['e0_y_j17_i1  ', num2str(X_ITER(272))]);
disp(['e0_y_j17_i2  ', num2str(X_ITER(273))]);
disp(['e0_y_j18_i1  ', num2str(X_ITER(274))]);
disp(['e0_y_j18_i2  ', num2str(X_ITER(275))]);
disp(['e0_y_j19_i1  ', num2str(X_ITER(276))]);
disp(['e0_y_j19_i2  ', num2str(X_ITER(277))]);
disp(['e0_y_j2_i1  ', num2str(X_ITER(278))]);
disp(['e0_y_j2_i2  ', num2str(X_ITER(279))]);
disp(['e0_y_j20_i1  ', num2str(X_ITER(280))]);
disp(['e0_y_j20_i2  ', num2str(X_ITER(281))]);
disp(['e0_y_j21_i1  ', num2str(X_ITER(282))]);
disp(['e0_y_j21_i2  ', num2str(X_ITER(283))]);
disp(['e0_y_j22_i1  ', num2str(X_ITER(284))]);
disp(['e0_y_j22_i2  ', num2str(X_ITER(285))]);
disp(['e0_y_j23_i1  ', num2str(X_ITER(286))]);
disp(['e0_y_j23_i2  ', num2str(X_ITER(287))]);
disp(['e0_y_j24_i1  ', num2str(X_ITER(288))]);
disp(['e0_y_j24_i2  ', num2str(X_ITER(289))]);
disp(['e0_y_j25_i1  ', num2str(X_ITER(290))]);
disp(['e0_y_j25_i2  ', num2str(X_ITER(291))]);
disp(['e0_y_j26_i1  ', num2str(X_ITER(292))]);
disp(['e0_y_j26_i2  ', num2str(X_ITER(293))]);
disp(['e0_y_j27_i1  ', num2str(X_ITER(294))]);
disp(['e0_y_j27_i2  ', num2str(X_ITER(295))]);
disp(['e0_y_j28_i1  ', num2str(X_ITER(296))]);
disp(['e0_y_j28_i2  ', num2str(X_ITER(297))]);
disp(['e0_y_j29_i1  ', num2str(X_ITER(298))]);
disp(['e0_y_j29_i2  ', num2str(X_ITER(299))]);
disp(['e0_y_j3_i1  ', num2str(X_ITER(300))]);
disp(['e0_y_j3_i2  ', num2str(X_ITER(301))]);
disp(['e0_y_j30_i1  ', num2str(X_ITER(302))]);
disp(['e0_y_j30_i2  ', num2str(X_ITER(303))]);
disp(['e0_y_j31_i1  ', num2str(X_ITER(304))]);
disp(['e0_y_j31_i2  ', num2str(X_ITER(305))]);
```

```
    disp(['e0_y_j32_i1  ', num2str(X_ITER(306))]);
    disp(['e0_y_j32_i2  ', num2str(X_ITER(307))]);
    disp(['e0_y_j33_i1  ', num2str(X_ITER(308))]);
    disp(['e0_y_j33_i2  ', num2str(X_ITER(309))]);
    disp(['e0_y_j34_i1  ', num2str(X_ITER(310))]);
    disp(['e0_y_j34_i2  ', num2str(X_ITER(311))]);
    disp(['e0_y_j35_i1  ', num2str(X_ITER(312))]);
    disp(['e0_y_j35_i2  ', num2str(X_ITER(313))]);
    disp(['e0_y_j36_i1  ', num2str(X_ITER(314))]);
    disp(['e0_y_j36_i2  ', num2str(X_ITER(315))]);
    disp(['e0_y_j37_i1  ', num2str(X_ITER(316))]);
    disp(['e0_y_j37_i2  ', num2str(X_ITER(317))]);
    disp(['e0_y_j38_i1  ', num2str(X_ITER(318))]);
    disp(['e0_y_j38_i2  ', num2str(X_ITER(319))]);
    disp(['e0_y_j39_i1  ', num2str(X_ITER(320))]);
    disp(['e0_y_j39_i2  ', num2str(X_ITER(321))]);
    disp(['e0_y_j4_i1  ', num2str(X_ITER(322))]);
    disp(['e0_y_j4_i2  ', num2str(X_ITER(323))]);
    disp(['e0_y_j40_i1  ', num2str(X_ITER(324))]);
    disp(['e0_y_j40_i2  ', num2str(X_ITER(325))]);
    disp(['e0_y_j41_i1  ', num2str(X_ITER(326))]);
    disp(['e0_y_j41_i2  ', num2str(X_ITER(327))]);
    disp(['e0_y_j42_i1  ', num2str(X_ITER(328))]);
    disp(['e0_y_j42_i2  ', num2str(X_ITER(329))]);
    disp(['e0_y_j43_i1  ', num2str(X_ITER(330))]);
    disp(['e0_y_j43_i2  ', num2str(X_ITER(331))]);
    disp(['e0_y_j44_i1  ', num2str(X_ITER(332))]);
    disp(['e0_y_j44_i2  ', num2str(X_ITER(333))]);
    disp(['e0_y_j45_i1  ', num2str(X_ITER(334))]);
    disp(['e0_y_j45_i2  ', num2str(X_ITER(335))]);
    disp(['e0_y_j46_i1  ', num2str(X_ITER(336))]);
    disp(['e0_y_j46_i2  ', num2str(X_ITER(337))]);
    disp(['e0_y_j47_i1  ', num2str(X_ITER(338))]);
    disp(['e0_y_j47_i2  ', num2str(X_ITER(339))]);
    disp(['e0_y_j48_i1  ', num2str(X_ITER(340))]);
    disp(['e0_y_j48_i2  ', num2str(X_ITER(341))]);
    disp(['e0_y_j49_i1  ', num2str(X_ITER(342))]);
    disp(['e0_y_j49_i2  ', num2str(X_ITER(343))]);
    disp(['e0_y_j5_i1  ', num2str(X_ITER(344))]);
    disp(['e0_y_j5_i2  ', num2str(X_ITER(345))]);
    disp(['e0_y_j50_i1  ', num2str(X_ITER(346))]);
    disp(['e0_y_j50_i2  ', num2str(X_ITER(347))]);
    disp(['e0_y_j6_i1  ', num2str(X_ITER(348))]);
    disp(['e0_y_j6_i2  ', num2str(X_ITER(349))]);
    disp(['e0_y_j7_i1  ', num2str(X_ITER(350))]);
    disp(['e0_y_j7_i2  ', num2str(X_ITER(351))]);
    disp(['e0_y_j8_i1  ', num2str(X_ITER(352))]);
    disp(['e0_y_j8_i2  ', num2str(X_ITER(353))]);
    disp(['e0_y_j9_i1  ', num2str(X_ITER(354))]);
    disp(['e0_y_j9_i2  ', num2str(X_ITER(355))]);

end
```

B. Aspen Plus Data



Heat and Material Balance Table				
Stream ID		1	2	3
Temperature	C	95.0	49.5	33.3
Pressure	bar	1.013	0.120	0.120
Vapor Frac		0.000	0.000	0.000
Mole Flow	kmol/hr	1080.000	356.040	723.960
Mass Flow	kg/hr	94512.582	32805.710	61706.872
Volume Flow	cum/hr	118.733	38.968	71.891
Enthalpy	MMkcal/hr	9.309	1.367	5.401
Mole Flow	kmol/hr			
BENZENE		356.400	trace	356.400
TOLUENE		723.600	356.040	367.560