User's Manual

MATLAB-based Educational Tool for Power System Analysis

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This user's manual for Power System Analysis Educational Tool provides two modes of running examples in each chapter with and without installing MATLAB$^{®}$. For the first mode the user can run the corresponding MATLAB code of each example under the MATLAB environment. For the second mode, the user is provided with a graphical user interface developed by MATLAB GUIDE to select each chapter example to validate hand calculation results. In the second mode some examples also allow the user to provide different input data to obtain different results. The second mode does need to install MATALB to run each example program.

1. Running the Educational Tool with Installing MATLAB

Under this mode, the user can run each individual example program under MATLAB environment. The version of MATLAB 2013a or newer versions are recommended. The example programs are located in the directory of **Example Matlab Code**. Each chapter sub-directory contains all example codes for the associated chapter.

2. Running the Educational Tool without Installing MATLAB

In this mode, the user needs to download MATLAB 2013(a) compiler (MATLAB Runtime) and install it in the Window-based personal computer or laptop. The compiler can be downloaded from the following the MATLAB official web site:

http://www.mathworks.com/products/compiler/mcr/index.html

In the MATALAB RUNTIME web page, the user will see the information regarding how to run compiled MATLAB applications or components without installing MATLAB. The following image with highlighted area indicates the compiler to be downloaded.

MATLAB Compiler

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not have MATLAB installed. When used together, MATLAB, MATLAB Compiler, and the MATLAB Runtime enable you to create and distribute numerical applications or software components quickly and securely.

To download and install the MATLAB Runtime:

1. Click the version and platform that corresponds to the application or component you are using.

   Note: you can find this information in the readme.txt file that accompanies the application or component.

Release (MATLAB Runtime Version#)	Windows	Linux	Mac
R2015b (9.0)*	32-bit / 64-bit	64-bit	Intel 64-bit
R2015aSP1 (8.5.1)	32-bit / 64-bit	64-bit	Intel 64-bit
R2015a (8.5)	32-bit / 64-bit	64-bit	Intel 64-bit
R2014b (8.4)	32-bit / 64-bit	64-bit	Intel 64-bit
R2014a (8.3)	32-bit / 64-bit	64-bit	Intel 64-bit
R2013b (8.2)	32-bit / 64-bit	64-bit	Intel 64-bit
R2013a (8.1)	32-bit / 64-bit	64-bit	Intel 64-bit
R2012b (8.0)	32-bit / 64-bit	64-bit	Intel 64-bit
R2012a (7.17)	32-bit / 64-bit	32-bit / 64-bit	Intel 64-bit

After installing MATLAB RUNTIME Compiler, the user can run the executable file of **power_system_v1.exe** to bring up the following main display showing each chapter title.
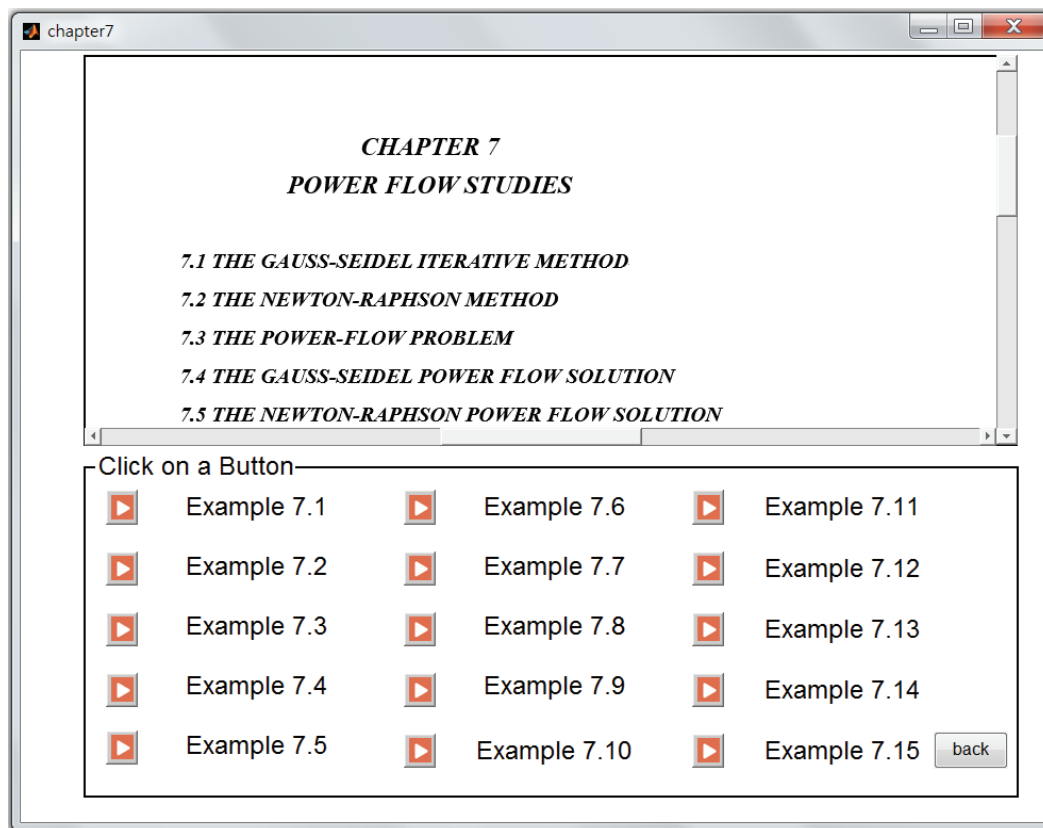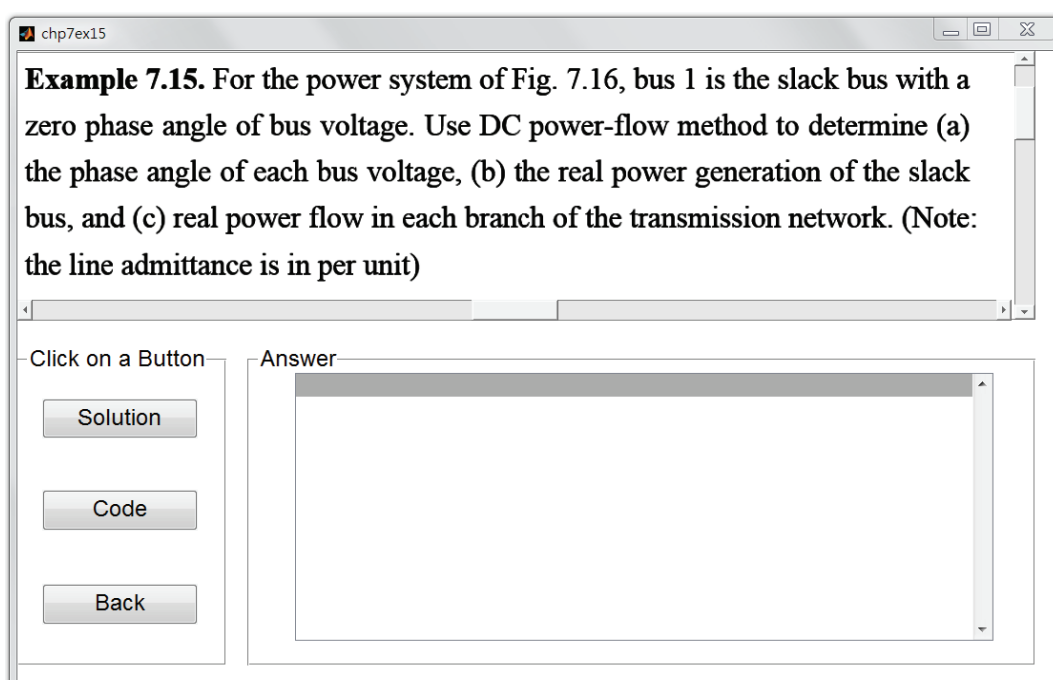

Examples of Power System Analysis

Please select the chapter which you need and click on the button

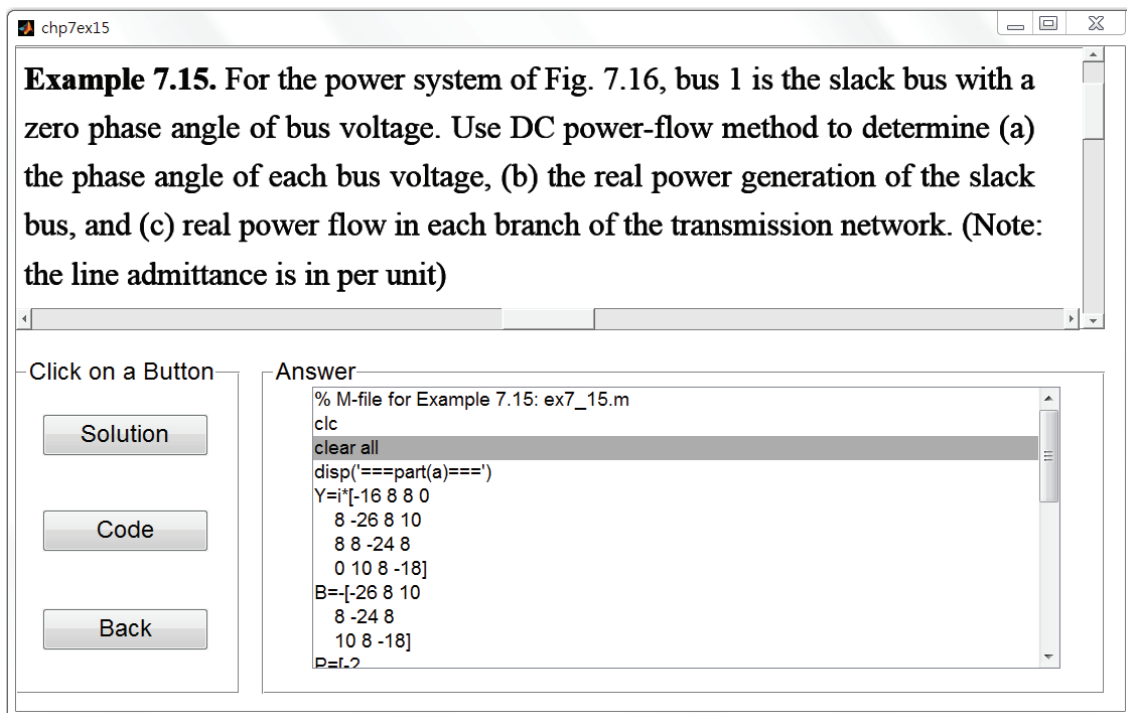|			
Chapter 2	Basic Concepts	**Chapter 8**	Symmetrical Faults
Chapter 3	Transformers And Synchronous Machines	**Chapter 9**	Symmetrical Components And Sequence Networks
Chapter 4	Parameters Of Transmission Lines	**Chapter 10**	Unsymmetrical Faults
Chapter 5	Modeling Transmission Lines	**Chapter 11**	Power System Protection
Chapter 6	Network Calculations	**Chapter 12**	Economic Dispatch And Automatic Generation Control Sequence Networks
Chapter 7	Power Flow Studies	**Chapter 13**	Power System Stability Quit

Through clicking on the chapter number, it will bring up another display listing all examples under the corresponding chapter. Listed below is the image after selecting the icon of **Chapter 7**.
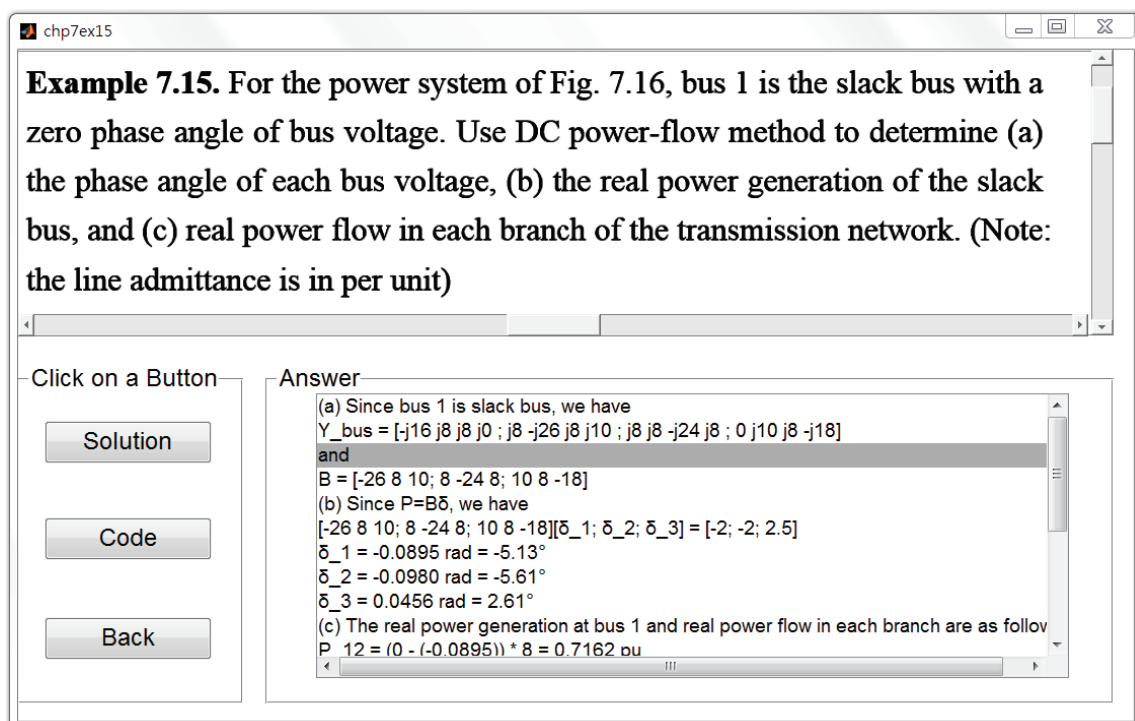

After the chapter 7 image has been brought up, the user can select the example problem to show a new image. For instance, after selecting the icon for Example 7.15, you will see the following image:

After clicking on the button of **Code** on the display image for Example 7.15, the MATLAB code for the example will show up in the following new display.

By clicking on the button of **Solution**, the following solution output display will show up.

Clicking on the button of **Back** will return to the display of Chapter 7 and clicking on the **Back** button of Chapter 7 will return to the main display.

For some other examples in Chapters 2 and 3, the user also can enter different input values to perform new simulations in addition to the default **Code** and **Solution** selections. For instance, in the display for Example 3.1 shown below the user can provide input values in the blank boxes and then click on the button of **Simulation** to obtain new results, as shown in the follow-up display.

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chp3ex1   ▭ ▢ ✕

Chapter 3

Example 3.1 ▾

Example 3.1. If $N_1 = 2000$ and $N_2 = 500$ in the circuit of Figure 3.3, and if $V_1 = 1200\angle 0°$ V and $I_1 = 5\angle -30°$ A with an impedance Z_2 connected across winding 2, find V_2, I_2, Z_2, and the impedance Z'_2, which is defined as the value of Z_2 referred to the primary side of the transformer.

Button Group

| Solution |
| Simulation |
| Code |
| Back |

Input

N1 =

N2 =

V1 = ∠ (Deg)

I1 = ∠ (Deg)

Answer

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chp3ex1   ▭ ▢ ✕

Chapter 3

Example 3.1 ▾

Example 3.1. If $N_1 = 2000$ and $N_2 = 500$ in the circuit of Figure 3.3, and if $V_1 = 1200\angle 0°$ V and $I_1 = 5\angle -30°$ A with an impedance Z_2 connected across winding 2, find V_2, I_2, Z_2, and the impedance Z'_2, which is defined as the value of Z_2 referred to the primary side of the transformer.

Button Group

| Solution |
| Simulation |
| Code |
| Back |

Input

N1 = 3000

N2 = 300

V1 = 2400 ∠ 30 (Deg)

I1 = 10 ∠ -45 (Deg)

Answer

N1 = 3000
N2 = 300
V1 = 2400∠30° V
V2 = 240∠30° V
I1 = 10∠-45° A
I2 = 100∠-45° A
Z2 = 2.4∠75° Ω
Z2new = 240∠75° Ω

Acknowledgement