APPENDIX A – MAIN INTRODUCTION OF CURRENT TRANSFORMER
(Introduction .m)

########################################################################
# INTRODUCTION
# PROGRAM DESIGNED BY:
# AHMAD NAJMI ABDULLAH (KGDO70005)
########################################################################

function varargout = MainBD(varargin)
MAINBD M-file for MainBD.fig
% MAINBD, by itself, creates a new MAINBD or raises the existing
% singleton*.
% H = MAINBD returns the handle to a new MAINBD or the handle to
% the existing singleton*.
% MAINBD('CALLBACK', hObject, eventData, handles, ...) calls the local
% function named CALLBACK in MAINBD.M with the given input
% arguments.
% MAINBD('Property', 'Value', ...) creates a new MAINBD or raises the
% existing singleton*. Starting from the left, property value
% pairs are
% applied to the GUI before MainBD_OpeningFcn gets called. An
% unrecognized property name or invalid value makes property
% application
% stop. All inputs are passed to MainBD_OpeningFcn via varargin.
% *See GUI Options on GUIDE's Tools menu. Choose "GUI allows only
% one
% instance to run (singleton)".

% See also: GUIDE, GUIDATA, GUIHANDLES

% Edit the above text to modify the response to help MainBD

% Last Modified by GUIDE v2.5 09-Aug-2009 20:43:37

% Begin initialization code - DO NOT EDIT
gui_Singleton = 1;
gui_State = struct('gui_Name', mfilename, ...
    'gui_Singleton', gui_Singleton, ...
    'gui_OpeningFcn', @MainBD_OpeningFcn, ...
    'gui_OutputFcn', @MainBD_OutputFcn, ...
    'gui_LayoutFcn', [], ...
    'gui_Callback', []);
if nargin && ischar(varargin{1})
    gui_State.gui_Callback = str2func(varargin{1});
eend

if nargout
    [varargout{1:nargout}] = gui_mainfcn(gui_State, varargin{:});
else
    gui_mainfcn(gui_State, varargin{:});
eend
% End initialization code - DO NOT EDIT

% --- Executes just before MainBD is made visible.
function MainBD_OpeningFcn(hObject, eventdata, handles, varargin)
% This function has no output args, see OutputFcn.
% hObject    handle to figure
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)
% varargin   command line arguments to MainBD (see VARARGIN)

backgroundImage = importdata('blockdiagram.jpg');
axes(handles.blockdiagram_pic);
image(backgroundImage);
axis off

backgroundImage = importdata('TX.jpg');
axes(handles.blockdiagram1_pic);
image(backgroundImage);
axis off

% Choose default command line output for MainBD
handles.output = hObject;

% Update handles structure
guidata(hObject, handles);

% UIWAIT makes MainBD wait for user response (see UIRESUME)
% uiwait(handles.figure1);

% --- Outputs from this function are returned to the command line.
function varargout = MainBD_OutputFcn(hObject, eventdata, handles)
% varargout  cell array for returning output args (see VARARGOUT);
% hObject    handle to figure
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Get default command line output from handles structure
varargout{1} = handles.output;

% --- Executes on button press in pushbutton2.
function pushbutton2_Callback(hObject, eventdata, handles)
% hObject    handle to pushbutton2 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)
KTF

% --- Executes on button press in pushbutton5.
function pushbutton5_Callback(hObject, eventdata, handles)
% hObject    handle to pushbutton5 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% --- Executes on button press in pushbutton7.
function pushbutton7_Callback(hObject, eventdata, handles)
% hObject    handle to pushbutton7 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)
APPENDIX B – OVERDIMENSIONING FACTOR-KTF (KTF.m)

CODES FOR OVERDIMENSIONING FACTOR – KTF
PROGRAM DESIGNED BY::
AHMAD NAJMI ABDULLAH (KG070005)

function varargout = KTF(varargin)
% KTF M-file for KTF.fig
% KTF, by itself, creates a new KTF or raises the existing
% singleton*.
% H = KTF returns the handle to a new KTF or the handle to
% the existing singleton*.
% KTF('CALLBACK',hObject,eventData,handles,...) calls the local
% function named CALLBACK in KTF.M with the given input arguments.
% KTF('Property','Value',...) creates a new KTF or raises the
% existing singleton*. Starting from the left, property value
% pairs are
% applied to the GUI before KTF_OpeningFunction gets called. An
% unrecognized property name or invalid value makes
% property application
% stop. All inputs are passed to KTF_OpeningFcn via varargin.
% *See GUI Options on GUIDE's Tools menu. Choose "GUI allows only
% one
% instance to run (singleton)".

% See also: GUIDE, GUIDATA, GUIDATA

% Edit the above text to modify the response to help KTF

% Last Modified by GUIDE v2.5 10-Sep-2009 10:04:58

% Begin initialization code - DO NOT EDIT

gui_Singleton = 1;
gui_State = struct('gui_Name', mfilename, ...
                 'gui_Singleton', gui_Singleton, ...
                 'gui_OpeningFcn', @KTF_OpeningFcn, ...
                 'gui_OutputFcn', @KTF_OutputFcn, ...
                 'gui_LayoutFcn', [], ..., ...
                 'gui_Callback', []);
if nargin && ischar(varargin{1})
    gui_State.gui_Callback = str2func(varargin{1});
end

if nargout
    varargin{1:nargout} = gui_mainfcn(gui_State, varargin{:});
else
    gui_mainfcn(gui_State, varargin{:});
end
% End initialization code - DO NOT EDIT
% --- Executes just before KTF is made visible.
function KTF_OpeningFcn(hObject, eventdata, handles, varargin)
% This function has no output args, see OutputFcn.
% hObject    handle to figure
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)
% varargin   command line arguments to KTF (see VARARGIN)

backgroundImage = importdata('ktf.jpg');
axes(handles.ktf_for);
image(backgroundImage);
axis off

backgroundImage = importdata('angle.jpg');
axes(handles.angle_for);
image(backgroundImage);
axis off

% Choose default command line output for KTF
handles.output = hObject;

% Update handles structure
guidata(hObject, handles);

% UIWAIT makes KTF wait for user response (see UIRESUME)
% uiwait(handles.figure1);

% --- Outputs from this function are returned to the command line.
function varargout = KTF_OutputFcn(hObject, eventdata, handles)
% varargout  cell array for returning output args (see VARARGOUT);
% hObject    handle to figure
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Get default command line output from handles structure
varargout{1} = handles.output;

% --- Executes on button press in pushbutton1.
function pushbutton1_Callback(hObject, eventdata, handles)
% hObject    handle to pushbutton1 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

a=[0.001 0.002 0.003 0.004 0.005 0.006 0.007 0.008 0.009 0.01 0.02 0.03
0.04 0.05 0.06 0.07 0.08 0.09 0.1]
b=[1.231 1.011 0.939 0.904 0.882 0.868 0.859 0.851 0.845 0.841 0.820
0.813 0.810 0.808 0.806 0.805 0.804 0.804 0.804 0.804 0.804 0.804]
c=[2.347 1.740 1.533 1.440 1.343 1.299 1.278 1.261 1.248 1.235 1.232
1.230 1.229 1.228 1.227 1.226 1.225 1.224 1.224 1.224 1.224 1.224]
d=[3.556 2.508 2.131 1.940 1.826 1.751 1.697 1.657 1.626 1.602 1.580
1.573 1.566 1.560 1.555 1.550 1.546 1.542 1.538 1.534 1.530 1.526]
e=[4.827 3.318 2.752 2.460 2.284 2.167 2.084 2.021 1.973 1.935 1.765
1.709 1.681 1.665 1.646 1.640 1.635 1.632 1.630 1.627 1.624 1.621]
1.941 1.902 1.879 1.864 1.853 1.845 1.838 1.833 1.831 1.829 1.827]
figure
axes('FontSize',13)
plot(a,b,'-o','LineWidth',0.5,'MarkerEdgeColor','r','MarkerFaceColor',[.49 1 .63], 'MarkerSize',3)
text(pi,0,'\leftarrow sin(\pi)', 'FontSize',18)
hold on
plot(a,c,'-go', 'LineWidth',0.5, 'MarkerEdgeColor','r', 'MarkerFaceColor',[.49 1 .63], 'MarkerSize',3)
hold on
plot(a,d,'-ro', 'LineWidth',0.5, 'MarkerEdgeColor','r', 'MarkerFaceColor',[.49 1 .63], 'MarkerSize',3)
hold on
plot(a,e,'-co', 'LineWidth',0.5, 'MarkerEdgeColor','r', 'MarkerFaceColor',[.49 1 .63], 'MarkerSize',3)
hold on
plot(a,f,'-mo', 'LineWidth',0.5, 'MarkerEdgeColor','r', 'MarkerFaceColor',[.49 1 .63], 'MarkerSize',3)
hold off
h = legend('2ms','4ms','6ms','8ms','10ms',5);
set(h,'Interpreter','none')
grid on
xlabel('Tn in ms')
ylabel('Degree(tn,Tn) (el.degree)')
title('Fault inception angle')

% --- Executes on button press in pushbutton2.
function pushbutton2_Callback(hObject, eventdata, handles)
    a=[0.001 0.002 0.003 0.004 0.005 0.006 0.007 0.008 0.009 0.01 0.02 0.03 0.04 0.05 0.06 0.07 0.08 0.09 0.1]
g=[0.2606 0.3861 0.4476 0.4834 0.5068 0.5233 0.5355 0.5449 0.5524 0.5584 0.5869 0.5968 0.6018 0.6049 0.6069 0.6084 0.6095 0.6104 0.6111]
h=[0.2862 0.5211 0.6719 0.7722 0.8428 0.8950 0.9351 0.9667 1.0136 1.1168 1.1543 1.1737 1.1855 1.1935 1.1992 1.2036 1.2070 1.2097]
i=[0.2800 0.5636 0.7815 0.9428 1.0643 1.1581 1.2325 1.2927 1.3424 1.3840 1.5951 1.6750 1.7170 1.7428 1.7604 1.7730 1.7826 1.7901 1.7961]
j=[0.2693 0.5721 0.8322 1.0418 1.2089 1.4533 1.6265 1.7626 1.8404 1.9296 2.0275 2.1613 2.2331 2.2777 2.3081 2.3302 2.3469 2.3600 2.3706]
k=[0.2580 0.5679 0.8526 1.0973 1.3020 1.4727 1.6159 1.7370 1.8404 1.9296 2.1613 2.6154 2.7234 2.7911 2.8375 2.8713 2.8969 2.9171 2.9334]

figure
axes('FontSize',13)
plot(a,g,'-o','LineWidth',0.5,'MarkerEdgeColor','r','MarkerFaceColor',[.49 1 .63], 'MarkerSize',3)
hold on
plot(a,h,'-go','LineWidth',0.5,'MarkerEdgeColor','r','MarkerFaceColor',[.49 1 .63], 'MarkerSize',3)
hold on

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plot(a,i,'-ro','LineWidth',0.5,'MarkerEdgeColor','r','MarkerFaceColor',[.49 1 .63],'MarkerSize',3)
hold on
plot(a,j,'-co','LineWidth',0.5,'MarkerEdgeColor','r','MarkerFaceColor',[.49 1 .63],'MarkerSize',3)
hold on
plot(a,k,'-mo','LineWidth',0.5,'MarkerEdgeColor','r','MarkerFaceColor',[.49 1 .63],'MarkerSize',3)
hold off
h = legend('2ms','4ms','6ms','8ms','10ms',5);
set(h,'Interpreter','none')
grid on
xlabel('Tn in ms')
ylabel('Ktf')
title('Transient Over-Dimensioning factor KTF','fontsize',20,'fontweight','b')

% --- Executes on button press in MainCore.
function MainCore_Callback(hObject, eventdata, handles)
% hObject    handle to MainCore (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)
MainCore;
APPENDIX C – CORE 1 – TRANSFORMER BIASSED DIFFERENTIAL PROTECTION (MainCore.m)

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CODES FOR CORE 1 - TRANSFORMER BIASSED DIFFERENTIAL PROTECTION
PROGRAM DESIGNED BY ::
AHMAD NAJMI ABDULLAH (KGD070005)
************************************************************************

function varargout = MainCore(varargin)
% MAINCORE M-file for MainCore.fig
% MAINCORE, by itself, creates a new MAINCORE or raises the existing
% singleton.
% H = MAINCORE returns the handle to a new MAINCORE or the handle to
% the existing singleton.
% MAINCORE('CALLBACK', hObject, eventData, handles, ...) calls the local
% function named CALLBACK in MAINCORE.M with the given input arguments.
% MAINCORE('Property', 'Value', ...) creates a new MAINCORE or raises the
% existing singleton. Starting from the left, property value pairs are
% applied to the GUI before MainCore_OpeningFunction gets called. An
% unrecognized property name or invalid value makes property application
% stop. All inputs are passed to MainCore_OpeningFcn via varargin.
% *See GUI Options on GUIDE's Tools menu. Choose "GUI allows only one
% instance to run (singleton)."

% See also: GUIDE, GUIDATA, GUIDATA
% Edit the above text to modify the response to help MainCore
% Last Modified by GUIDE v2.5 12-Nov-2009 15:23:47
% Begin initialization code - DO NOT EDIT
gui_Singleton = 1;
gui_State = struct('gui_Name', mfilename, ...
    'gui_Singleton', gui_Singleton, ...
    'gui_OpeningFcn', @MainCore_OpeningFcn, ...
    'gui_OutputFcn', @MainCore_OutputFcn, ...
    'gui_LayoutFcn', [], ...
    'gui_Callback', []);
if nargin && ischar(varargin{1})
    gui_State.gui_Callback = str2func(varargin{1});
end
if nargout
    varargout{1:nargout} = gui_mainfcn(gui_State, varargin{:});
else
    gui_mainfcn(gui_State, varargin{:});
end
gui_mainfcn(gui_State, varargin{:});
end
% End initialization code — DO NOT EDIT

% --- Executes just before MainCore is made visible.
function MainCore_OpeningFcn(hObject, eventdata, handles, varargin)
% This function has no output args, see OutputFcn.
% hObject    handle to figure
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)
% varargin   command line arguments to MainCore (see VARARGIN)

backgroundImage = importdata('kbch130.jpg');
axes(handles.kbch_pic);
image(backgroundImage);
axis off

backgroundImage = importdata('CT1.jpg');
axes(handles.CT_pic);
image(backgroundImage);
axis off

% Choose default command line output for MainCore
handles.output = hObject;

% Update handles structure
guidata(hObject, handles);

% UIWAIT makes MainCore wait for user response (see UIRESUME)
% uiwait(handles.figure1);

% --- Outputs from this function are returned to the command line.
function varargout = MainCore_OutputFcn(hObject, eventdata, handles)
% varargout  cell array for returning output args (see VARARGOUT);
% hObject    handle to figure
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Get default command line output from handles structure
varargout{1} = handles.output;

% --- Executes on button press in togglebutton1.
function togglebutton1_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton1 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of togglebutton1

% --- Executes on button press in togglebutton2.
function togglebutton2_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton2 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of togglebutton2
function Ip2_Callback(hObject, eventdata, handles)
% hObject    handle to Ip2 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hints: get(hObject,'String') returns contents of Ip2 as text
% str2double(get(hObject,'String')) returns contents of Ip2 as a double

handles.Ip2=str2double(get(hObject,'string'));
if isnan(handles.Ip2)
    errordlg(['you must enter a numeric value','Error'])
end

guidata(hObject,handles)

% --- Executes during object creation, after setting all properties.
function Ip2_CreateFcn(hObject, eventdata, handles)
% hObject    handle to Ip2 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    empty - handles not created until after all CreateFcns called

% Hint: edit controls usually have a white background on Windows.
%       See ISPC and COMPUTER.
if ispc && isequal(get(hObject,'BackgroundColor'),
    get(0,'defaultUicontrolBackgroundColor'))
    set(hObject,'BackgroundColor','white');
end

function Ip3_Callback(hObject, eventdata, handles)
% hObject    handle to Ip3 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hints: get(hObject,'String') returns contents of Ip3 as text
% str2double(get(hObject,'String')) returns contents of Ip3 as a double

handles.Ip3=str2double(get(hObject,'string'));
if isnan(handles.Ip3)
    errordlg(['you must enter a numeric value','Error'])
end

guidata(hObject,handles)

% --- Executes during object creation, after setting all properties.
function Ip3_CreateFcn(hObject, eventdata, handles)
% hObject    handle to Ip3 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    empty - handles not created until after all CreateFcns called
% Hint: edit controls usually have a white background on Windows.
%       See ISPC and COMPUTER.
if ispc && isequal(get(hObject,'BackgroundColor'),
    get(0,'defaultUicontrolBackgroundColor'))
    set(hObject,'BackgroundColor','white');
end
% --- Executes on button press in togglebutton3.
function togglebutton3_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton3 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of togglebutton3

% --- Executes on button press in togglebutton4.
function togglebutton4_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton4 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of togglebutton4

% --- Executes on button press in togglebutton5.
function togglebutton5_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton5 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of togglebutton5

% --- Executes on button press in Rct1.
function Rct1_Callback(hObject, eventdata, handles)
% hObject    handle to Rct1 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of Rct1

function Rr_Callback(hObject, eventdata, handles)
% hObject    handle to Rr (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hints: get(hObject,'String') returns contents of Rr as text
%        str2double(get(hObject,'String')) returns contents of Rr as a double

handles.Rr=str2double(get(hObject,'String'));
if isnan(handles.Rr)
    errordlg('you must enter a numeric value','Error')
end
guidata(hObject,handles)

% --- Executes during object creation, after setting all properties.
function Rr_CreateFcn(hObject, eventdata, handles)
% hObject    handle to Rr (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    empty - handles not created until after all CreateFcns called

% Hint: edit controls usually have a white background on Windows.
%        See ISPC and COMPUTER.
if ispc && isequal(get(hObject,'BackgroundColor'),
                   get(0,'defaultUicontrolBackgroundColor'))
    set(hObject,'BackgroundColor','white');
end

function VA1_Callback(hObject, eventdata, handles)
    % hObject    handle to VA1 (see GCBO)
    % eventdata  reserved - to be defined in a future version of MATLAB
    % handles    structure with handles and user data (see GUIDATA)

    % Hints: get(hObject,'String') returns contents of VA1 as text
    %        str2double(get(hObject,'String')) returns contents of VA1 as a
double
    handles.VA1=str2double(get(hObject,'string'));
    if isnan(handles.VA1)
        errordlg('you must enter a numeric value','Error')
    end
    GUIDATA(hObject,handles)

    % --- Executes during object creation, after setting all properties.
    function VA1_CreateFcn(hObject, eventdata, handles)
    % hObject    handle to VA1 (see GCBO)
    % eventdata  reserved - to be defined in a future version of MATLAB
    % handles    empty - handles not created until after all CreateFcns
    called

    % Hint: edit controls usually have a white background on Windows.
    %       See ISPC and COMPUTER.
    if ispc && isequal(get(hObject,'BackgroundColor'),
                   get(0,'defaultUicontrolBackgroundColor'))
        set(hObject,'BackgroundColor','white');
    end

    % --- Executes on button press in pushbutton1.
    function pushbutton1_Callback(hObject, eventdata, handles)
    % hObject    handle to pushbutton1 (see GCBO)
    % eventdata  reserved - to be defined in a future version of MATLAB
    % handles    structure with handles and user data (see GUIDATA)

    % To calculate highest CT Secondary resistance
    Rct1=(handles.Ip1)*(handles.Ohm);
    set(handles.Rct1,'string',Rct1);

    % To calculate Knee point Voltage
    RL=2*(handles.Ic)*(handles.Cr);
    Vknee=handles.ALF*(handles.VA1+Rct1);
    set(handles.Vknee,'string',Vknee);

    % To calculate the Actual Connected resistance
    Rb=RL+(handles.Rr);
    set(handles.Rb,'string',Rb);

    % To calculate Acccurate Burden
    VA=(Vknee/(handles.ALF))-Rct1;
    set(handles.VA,'string',VA);

    % --- Executes on button press in pushbutton2.
function pushbutton2_Callback(hObject, eventdata, handles)
    hObject    handle to pushbutton2 (see GCBO)
    eventdata  reserved - to be defined in a future version of MATLAB
    handles    structure with handles and user data (see GUIDATA)

function Vs_Callback(hObject, eventdata, handles)
    hObject    handle to Vs (see GCBO)
    eventdata  reserved - to be defined in a future version of MATLAB
    handles    structure with handles and user data (see GUIDATA)

    % Hints: get(hObject,'String') returns contents of Vs as text
    %        str2double(get(hObject,'String')) returns contents of Vs as a
do
    handles.Vs=str2double(get(hObject,'string'));
    if isnan(handles.Vs)
        errordlg('you must enter a numeric value','Error')
    end

    guidata(hObject,handles)

% --- Executes during object creation, after setting all properties.
function Vs_CreateFcn(hObject, eventdata, handles)
    hObject    handle to Vs (see GCBO)
    eventdata  reserved - to be defined in a future version of MATLAB
    handles    empty - handles not created until after all CreateFcns
    called

    % Hint: edit controls usually have a white background on Windows.
    % See ISPC and COMPUTER.
    if ispc && isequal(get(hObject,'BackgroundColor'),
    get(0,'defaultUicontrolBackgroundColor'))
        set(hObject,'BackgroundColor','white');
    end

% --- Executes on button press in togglebutton7.
function togglebutton7_Callback(hObject, eventdata, handles)
    hObject    handle to togglebutton7 (see GCBO)
    eventdata  reserved - to be defined in a future version of MATLAB
    handles    structure with handles and user data (see GUIDATA)

    % To calculate the Dc times constant of the applicable fault loop
    T1=((handles.Xr)/(2*pi*(handles.f)));
    set(handles.T1,'string',T1);

    % To calculate the Source impedance
    Zs=handles.Vs*1000/(sqrt(3)*handles.If*1000);
    set(handles.Zs,'string',Zs);

    % To calculate the Real part of Source impedance
    Rs=(1.1)*(Zs)*((cos((83.08*pi)/180)));
    set(handles.Rs,'string',Rs);

    % To calculate the imag part of Source impedance
    Xs=(1.1)*(Zs)*((sin((83.08*pi)/180)));
    set(handles.Xs,'string',Xs);

    % To Calculate the Actual Source impedance
Zbs=sqrt(Rs^2+Xs^2);
set(handles.Zbs,'string',Zbs);

% To Calculate the real part of Line Impedance
Rl=(0.2887)*(0.8)*(handles.L)*(cos((83.08*pi)/180));
set(handles.Rl,'string',Rl);

% To Calculate the imag part of Line Impedance
Xl=(0.2887)*(0.8)*(handles.L)*(sin((83.08*pi)/180));
set(handles.Xl,'string',Xl);

% To calculate the Actual Line Impedance
Zbl=sqrt(Rl^2+Xl^2);
set(handles.Zbl,'string',Zbl);

% To calculate the Lead resistance
RL=2*(handles.Ic)*(handles.Cr);
set(handles.RL,'string',RL);

% To calculate the overall Total impedance
ZT=sqrt(((Rs+Rl)^2)+((Xs+Xl)^2));
set(handles.ZT,'string',ZT);

% To calculate the transient overdimensioning factor
Ktf=0.75;
set(handles.Ktf,'string',Ktf);

% To calculate the transient overdimensioning that consider remanence
Krem=1/(1-handles.Kr);
set(handles.Krem,'string',Krem);

% to calculate full load current in primary
Ip=(handles.MVA*1000000)/(handles.Vs*1000*sqrt(3));
set(handles.Ip,'string',Ip);

% Hint: get(hObject,'Value') returns toggle state of togglebutton7

% --- Executes on button press in pushbutton3.
% function pushbutton3_Callback(hObject, eventdata, handles)
% hObject handle to pushbutton3 (see GCBO)
% eventdata reserved - to be defined in a future version of MATLAB
% handles structure with handles and user data (see GUIDATA)
Ktf=0.75;
Zs=handles.Vs*1000/(sqrt(3)*handles.If*1000);
If1=(1.1*(handles.Vs*1000/sqrt(3)))/Zs;
ALF10=(If1/(handles.Ip1))*Ktf;
set(handles.ALF10,'string',ALF10);

RL=2*(handles.Ic)*(handles.Cr);
Rct1=(handles.Ip1)*(handles.Ohm);
Rb=RL+(handles.Rr);

% To calculate Actual Accuracy Limit factor
Pi=(handles.Ip3)*Rct1;
Pn=handles.VA1;
Pb=(handles.Ip3)*(RL+(handles.Rr));

ALF2=(ALF10)*((Pi+Pb)/(Pi+Pn));

set(handles.ALF2,'string',ALF2);

% To calculate Actual knee point Voltage
Vknee1=(ALF2)*(handles.Ip3)*(Rct1+Rb);

set(handles.Vknee1,'string',Vknee1);

% To calculate Actual Burden
VA2=(Vknee1/ALF2)-Rct1;

set(handles.VA2,'string',VA2);

% Compare the Accuracy Limit Factor
i=1;
if ALF2<=handles.ALF20 && Vknee1<=handles.Vknee20 && VA2<=handles.VA20
    e{i}=sprintf('CT is Adequate\n');
else
e{i}=sprintf('CT is not Adequate\n');
end

handles.list=[e];

set(handles.status,'string',handles.list);

guidata(hObject, handles);

% --- Executes on button press in pushbutton4.
function pushbutton4_Callback(hObject, eventdata, handles)
    % hObject    handle to pushbutton4 (see GCBO)
    % eventdata  reserved - to be defined in a future version of MATLAB
    % handles    structure with handles and user data (see GUIDATA)
    core1;

% --- Executes on button press in Rb.
function Rb_Callback(hObject, eventdata, handles)
    % hObject    handle to Rb (see GCBO)
    % eventdata  reserved - to be defined in a future version of MATLAB
    % handles    structure with handles and user data (see GUIDATA)
    % Hint: get(hObject,'Value') returns toggle state of Rb

% --- Executes on button press in togglebutton9.
function togglebutton9_Callback(hObject, eventdata, handles)
    % hObject    handle to togglebutton9 (see GCBO)
    % eventdata  reserved - to be defined in a future version of MATLAB
    % handles    structure with handles and user data (see GUIDATA)
    % Hint: get(hObject,'Value') returns toggle state of togglebutton9

% --- Executes on button press in togglebutton10.
function togglebutton10_Callback(hObject, eventdata, handles)
    % hObject    handle to togglebutton10 (see GCBO)
    % eventdata  reserved - to be defined in a future version of MATLAB
    % handles    structure with handles and user data (see GUIDATA)
    % Hint: get(hObject,'Value') returns toggle state of togglebutton10

% --- Executes on button press in Ip.
function Ip_Callback(hObject, eventdata, handles)
    % hObject    handle to Ip (see GCBO)
function togglebutton12_Callback(hObject, eventdata, handles)
    help togglebutton12
end

function togglebutton13_Callback(hObject, eventdata, handles)
    help togglebutton13
end

function togglebutton14_Callback(hObject, eventdata, handles)
    help togglebutton14
end

function If_Callback(hObject, eventdata, handles)
    help If
end

function If_CreateFcn(hObject, eventdata, handles)
    help If
end

% Hint: edit controls usually have a white background on Windows. % See ISPC and COMPUTER.
if ispc && isequal(get(hObject,'BackgroundColor'), get(0,'defaultUicontrolBackgroundColor'))
    set(hObject,'BackgroundColor','white');
end
% --- Executes on button press in togglebutton15.
function togglebutton15_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton15 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of togglebutton15

function f_Callback(hObject, eventdata, handles)
% hObject    handle to f (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hints: get(hObject,'String') returns contents of f as text
% str2double(get(hObject,'String')) returns contents of f as a double

handles.f=str2double(get(hObject,'string'));
if isnan(handles.f)
    errordlg('you must enter a numeric value','Error')
end

guidata(hObject,handles)

% --- Executes during object creation, after setting all properties.
function f_CreateFcn(hObject, eventdata, handles)
% hObject    handle to f (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    empty - handles not created until after all CreateFcns called

% Hint: edit controls usually have a white background on Windows.
% See ISPC and COMPUTER.
if ispc && isequal(get(hObject,'BackgroundColor'),
get(0,'defaultUicontrolBackgroundColor'))
    set(hObject,'BackgroundColor','white');
end

function Xr_Callback(hObject, eventdata, handles)
% hObject    handle to Xr (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hints: get(hObject,'String') returns contents of Xr as text
% str2double(get(hObject,'String')) returns contents of Xr as a double

handles.Xr=str2double(get(hObject,'string'));
if isnan(handles.Xr)
    errordlg('you must enter a numeric value','Error')
end

guidata(hObject,handles)

% --- Executes during object creation, after setting all properties.
function Xr_CreateFcn(hObject, eventdata, handles)
% hObject    handle to Xr (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles  empty - handles not created until after all CreateFcns called

% Hint: edit controls usually have a white background on Windows.
%       See ISPC and COMPUTER.
if ispc && isequal(get(hObject,'BackgroundColor'),
get(0,'defaultUicontrolBackgroundColor'))
    set(hObject, 'BackgroundColor', 'white');
end

% -- Executes on button press in togglebutton16.
function togglebutton16_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton16 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of togglebutton16

function Ic_Callback(hObject, eventdata, handles)
% hObject    handle to Ic (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hints: get(hObject,'String') returns contents of Ic as text
%        str2double(get(hObject,'String')) returns contents of Ic as a double
handles.Ic=str2double(get(hObject,'string'));
if isnan(handles.Ic)
    errordlg('you must enter a numeric value','Error')
end
guidata(hObject,handles)

% -- Executes during object creation, after setting all properties.
function Ic_CreateFcn(hObject, eventdata, handles)
% hObject    handle to Ic (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    empty - handles not created until after all CreateFcns called

% Hint: edit controls usually have a white background on Windows.
%       See ISPC and COMPUTER.
if ispc && isequal(get(hObject,'BackgroundColor'),
get(0,'defaultUicontrolBackgroundColor'))
    set(hObject, 'BackgroundColor', 'white');
end

% -- Executes on button press in togglebutton17.
function togglebutton17_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton17 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of togglebutton17

function Cc_Callback(hObject, eventdata, handles)
% hObject    handle to Cc (see GCBO)
% eventdata reserved - to be defined in a future version of MATLAB
% handles structure with handles and user data (see GUIDATA)

% Hints: get(hObject,'String') returns contents of Cc as text
% str2double(get(hObject,'String')) returns contents of Cc as a double

handles.Cc=str2double(get(hObject,'string'));
if isnan(handles.Cc)
    errordlg('you must enter a numeric value','Error')
end
guidata(hObject,handles)

% --- Executes during object creation, after setting all properties.
function Cc_CreateFcn(hObject, eventdata, handles)
    % hObject    handle to Cc (see GCBO)
    % eventdata reserved - to be defined in a future version of MATLAB
    % handles empty - handles not created until after all CreateFcn

    % Hint: edit controls usually have a white background on Windows.
    % See ISPC and COMPUTER.
    if ispc && isequal(get(hObject,'BackgroundColor'),
    get(0,'defaultUicontrolBackgroundColor'))
        set(hObject,'BackgroundColor','white');
    end

% --- Executes on button press in togglebutton18.
function togglebutton18_Callback(hObject, eventdata, handles)
    % hObject    handle to togglebutton18 (see GCBO)
    % eventdata reserved - to be defined in a future version of MATLAB
    % handles structure with handles and user data (see GUIDATA)

    % Hint: get(hObject,'Value') returns toggle state of togglebutton18

function Cr_Callback(hObject, eventdata, handles)
    % hObject    handle to Cr (see GCBO)
    % eventdata reserved - to be defined in a future version of MATLAB
    % handles structure with handles and user data (see GUIDATA)

    % Hints: get(hObject,'String') returns contents of Cr as text
    % str2double(get(hObject,'String')) returns contents of Cr as a double

handles.Cr=str2double(get(hObject,'string'));
if isnan(handles.Cr)
    errordlg('you must enter a numeric value','Error')
end
guidata(hObject,handles)

% --- Executes during object creation, after setting all properties.
function Cr_CreateFcn(hObject, eventdata, handles)
    % hObject    handle to Cr (see GCBO)
    % eventdata reserved - to be defined in a future version of MATLAB
    % handles empty - handles not created until after all CreateFcn

    % Hint: edit controls usually have a white background on Windows.
    % See ISPC and COMPUTER.
if ispc && isequal(get(hObject,'BackgroundColor'),
get(0,'defaultUicontrolBackgroundColor'))
    set(hObject,'BackgroundColor','white');
end

% --- Executes on button press in togglebutton19.
function togglebutton19_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton19 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of togglebutton19

function L_Callback(hObject, eventdata, handles)
% hObject    handle to L (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hints: get(hObject,'String') returns contents of L as text
%        str2double(get(hObject,'String')) returns contents of L as a
double

handles.L=str2double(get(hObject,'string'));
if isnan(handles.L)
    errordlg('you must enter a numeric value','Error')
end
guidata(hObject,handles)

% --- Executes during object creation, after setting all properties.
function L_CreateFcn(hObject, eventdata, handles)
% hObject    handle to L (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    empty - handles not created until after all CreateFcns
called

% Hint: edit controls usually have a white background on Windows.
%       See ISPC and COMPUTER.
if ispc && isequal(get(hObject,'BackgroundColor'),
get(0,'defaultUicontrolBackgroundColor'))
    set(hObject,'BackgroundColor','white');
end

% --- Executes on button press in togglebutton20.
function togglebutton20_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton20 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of togglebutton20

function ohm_Callback(hObject, eventdata, handles)
% hObject    handle to ohm (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hints: get(hObject,'String') returns contents of ohm as text
str2double(get(hObject,'String')) returns contents of ohm as a double

handles.Ohm=str2double(get(hObject,'string'));
if isnan(handles.Ohm)
    errordlg('you must enter a numeric value','Error')
end
guidata(hObject,handles)

% --- Executes during object creation, after setting all properties.
function ohm_CreateFcn(hObject, eventdata, handles)
% hObject    handle to ohm (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    empty - handles not created until after all CreateFcns called

% Hint: edit controls usually have a white background on Windows.
%       See ISPC and COMPUTER.
if ispc && isequal(get(hObject,'BackgroundColor'),
    get(0,'defaultUicontrolBackgroundColor'))
    set(hObject,'BackgroundColor','white');
end

% --- Executes on button press in togglebutton21.
function togglebutton21_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton21 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of togglebutton21
function Kr_Callback(hObject, eventdata, handles)
% hObject    handle to Kr (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hints: get(hObject,'String') returns contents of Kr as text
%        str2double(get(hObject,'String')) returns contents of Kr as a double
handles.Kr=str2double(get(hObject,'string'));
if isnan(handles.Kr)
    errordlg('you must enter a numeric value','Error')
end
guidata(hObject,handles)

% --- Executes during object creation, after setting all properties.
function Kr_CreateFcn(hObject, eventdata, handles)
% hObject    handle to Kr (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    empty - handles not created until after all CreateFcns called

% Hint: edit controls usually have a white background on Windows.
%       See ISPC and COMPUTER.
if ispc && isequal(get(hObject,'BackgroundColor'),
    get(0,'defaultUicontrolBackgroundColor'))
    set(hObject,'BackgroundColor','white');
end
function togglebutton22_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton22 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of togglebutton22

function ALF_Callback(hObject, eventdata, handles)
% hObject    handle to ALF (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hints: get(hObject,'String') returns contents of ALF as text
% str2double(get(hObject,'String')) returns contents of ALF as a double

handles.ALF=str2double(get(hObject,'string'));
if isnan(handles.ALF)
    errordlg('you must enter a numeric value','Error')
end
guidata(hObject,handles)

function ALF_CreateFcn(hObject, eventdata, handles)
% hObject    handle to ALF (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    empty - handles not created until after all CreateFcns called

% Hint: edit controls usually have a white background on Windows.
% See ISPC and COMPUTER.
if ispc && isequal(get(hObject,'BackgroundColor'),
get(0,'defaultUicontrolBackgroundColor'))
    set(hObject,'BackgroundColor','white');
end

function pushbutton5_Callback(hObject, eventdata, handles)
% hObject    handle to pushbutton5 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

function Zs_Callback(hObject, eventdata, handles)
% hObject    handle to Zs (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

function pushbutton6_Callback(hObject, eventdata, handles)
% hObject    handle to pushbutton6 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% --- Executes on button press in Zbs.
function Zbs_Callback(hObject, eventdata, handles)
    % hObject    handle to Zbs (see GCBO)
    % eventdata  reserved - to be defined in a future version of MATLAB
    % handles    structure with handles and user data (see GUIDATA)

    % Hint: get(hObject,'Value') returns toggle state of Zbs

% --- Executes on button press in pushbutton7.
function pushbutton7_Callback(hObject, eventdata, handles)
    % hObject    handle to pushbutton7 (see GCBO)
    % eventdata  reserved - to be defined in a future version of MATLAB
    % handles    structure with handles and user data (see GUIDATA)

    % --- Executes on button press in Rs.
function Rs_Callback(hObject, eventdata, handles)
    % hObject    handle to Rs (see GCBO)
    % eventdata  reserved - to be defined in a future version of MATLAB
    % handles    structure with handles and user data (see GUIDATA)

    % Hint: get(hObject,'Value') returns toggle state of Rs

% --- Executes on button press in pushbutton8.
function pushbutton8_Callback(hObject, eventdata, handles)
    % hObject    handle to pushbutton8 (see GCBO)
    % eventdata  reserved - to be defined in a future version of MATLAB
    % handles    structure with handles and user data (see GUIDATA)

% --- Executes on button press in Xs.
function Xs_Callback(hObject, eventdata, handles)
    % hObject    handle to Xs (see GCBO)
    % eventdata  reserved - to be defined in a future version of MATLAB
    % handles    structure with handles and user data (see GUIDATA)

    % Hint: get(hObject,'Value') returns toggle state of Xs

% --- Executes on button press in pushbutton9.
function pushbutton9_Callback(hObject, eventdata, handles)
    % hObject    handle to pushbutton9 (see GCBO)
    % eventdata  reserved - to be defined in a future version of MATLAB
    % handles    structure with handles and user data (see GUIDATA)

% --- Executes on button press in T1.
function T1_Callback(hObject, eventdata, handles)
    % hObject    handle to T1 (see GCBO)
    % eventdata  reserved - to be defined in a future version of MATLAB
    % handles    structure with handles and user data (see GUIDATA)

    % Hint: get(hObject,'Value') returns toggle state of T1

% --- Executes on button press in pushbutton10.
function pushbutton10_Callback(hObject, eventdata, handles)
    % hObject    handle to pushbutton10 (see GCBO)
    % eventdata  reserved - to be defined in a future version of MATLAB

% handles    structure with handles and user data (see GUIDATA)

% --- Executes on button press in Zbl.
function Zbl_Callback(hObject, eventdata, handles)
% hObject    handle to Zbl (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of Zbl

% --- Executes on button press in pushbutton11.
function pushbutton11_Callback(hObject, eventdata, handles)
% hObject    handle to pushbutton11 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% --- Executes on button press in Rl.
function Rl_Callback(hObject, eventdata, handles)
% hObject    handle to Rl (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of Rl
% --- Executes on button press in pushbutton12.
function pushbutton12_Callback(hObject, eventdata, handles)
% hObject    handle to pushbutton12 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% --- Executes on button press in Xl.
function Xl_Callback(hObject, eventdata, handles)
% hObject    handle to Xl (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of Xl
% --- Executes on button press in pushbutton13.
function pushbutton13_Callback(hObject, eventdata, handles)
% hObject    handle to pushbutton13 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% --- Executes on button press in togglebutton31.
function togglebutton31_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton31 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of togglebutton31
% --- Executes on button press in pushbutton14.
function pushbutton14_Callback(hObject, eventdata, handles)
% hObject    handle to pushbutton14 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)
% --- Executes on button press in ZT.  
function ZT_Callback(hObject, eventdata, handles)  
  hObject handle to ZT (see GCBO)  
  eventdata reserved - to be defined in a future version of MATLAB  
  handles structure with handles and user data (see GUIDATA)  

% Hint: get(hObject,'Value') returns toggle state of ZT  

% --- Executes on button press in pushbutton15.  
function pushbutton15_Callback(hObject, eventdata, handles)  
  hObject handle to pushbutton15 (see GCBO)  
  eventdata reserved - to be defined in a future version of MATLAB  
  handles structure with handles and user data (see GUIDATA)  

% --- Executes on button press in Ktf.  
function Ktf_Callback(hObject, eventdata, handles)  
  hObject handle to Ktf (see GCBO)  
  eventdata reserved - to be defined in a future version of MATLAB  
  handles structure with handles and user data (see GUIDATA)  

% Hint: get(hObject,'Value') returns toggle state of Ktf  

% --- Executes on button press in pushbutton16.  
function pushbutton16_Callback(hObject, eventdata, handles)  
  hObject handle to pushbutton16 (see GCBO)  
  eventdata reserved - to be defined in a future version of MATLAB  
  handles structure with handles and user data (see GUIDATA)  

% --- Executes on button press in Krem.  
function Krem_Callback(hObject, eventdata, handles)  
  hObject handle to Krem (see GCBO)  
  eventdata reserved - to be defined in a future version of MATLAB  
  handles structure with handles and user data (see GUIDATA)  

% Hint: get(hObject,'Value') returns toggle state of Krem  

% --- Executes on button press in pushbutton17.  
function pushbutton17_Callback(hObject, eventdata, handles)  
  hObject handle to pushbutton17 (see GCBO)  
  eventdata reserved - to be defined in a future version of MATLAB  
  handles structure with handles and user data (see GUIDATA)  

% --- Executes on button press in Rct2.  
function Rct2_Callback(hObject, eventdata, handles)  
  hObject handle to Rct2 (see GCBO)  
  eventdata reserved - to be defined in a future version of MATLAB  
  handles structure with handles and user data (see GUIDATA)  

% Hint: get(hObject,'Value') returns toggle state of Rct2  

% --- Executes on button press in togglebutton36.  
function togglebutton36_Callback(hObject, eventdata, handles)  
  hObject handle to togglebutton36 (see GCBO)  
  eventdata reserved - to be defined in a future version of MATLAB  
  handles structure with handles and user data (see GUIDATA)
% Hint: get(hObject,'Value') returns toggle state of togglebutton36

% --- Executes on button press in togglebutton37.
function togglebutton37_Callback(hObject, eventdata, handles)
    % hObject    handle to togglebutton37 (see GCBO)
    % eventdata  reserved - to be defined in a future version of MATLAB
    % handles    structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of togglebutton37

% --- Executes on button press in togglebutton38.
function togglebutton38_Callback(hObject, eventdata, handles)
    % hObject    handle to togglebutton38 (see GCBO)
    % eventdata  reserved - to be defined in a future version of MATLAB
    % handles    structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of togglebutton38

function Ip1_Callback(hObject, eventdata, handles)
    % hObject    handle to Ip1 (see GCBO)
    % eventdata  reserved - to be defined in a future version of MATLAB
    % handles    structure with handles and user data (see GUIDATA)
    % Hints: get(hObject,'String') returns contents of Ip1 as text
    %        str2double(get(hObject,'String')) returns contents of Ip1 as a double

    handles.Ip1=str2double(get(hObject,'String'));
    if isnan(handles.Ip1)
        errordlg('you must enter a numeric value','Error')
    end
    guidata(hObject,handles)

% --- Executes during object creation, after setting all properties.
function Ip1_CreateFcn(hObject, eventdata, handles)
    % hObject    handle to Ip1 (see GCBO)
    % eventdata  reserved - to be defined in a future version of MATLAB
    % handles    empty - handles not created until after all CreateFcns called

    % Hint: edit controls usually have a white background on Windows.
    %        See ISPC and COMPUTER.
    if ispc && isequal(get(hObject,'BackgroundColor'),
        get(0,'defaultUicontrolBackgroundColor'))
        set(hObject,'BackgroundColor','white');
    end

% --- Executes on button press in togglebutton39.
function togglebutton39_Callback(hObject, eventdata, handles)
    % hObject    handle to togglebutton39 (see GCBO)
    % eventdata  reserved - to be defined in a future version of MATLAB
    % handles    structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of togglebutton39

% --- Executes on button press in togglebutton40.
function togglebutton40_Callback(hObject, eventdata, handles)
    % hObject    handle to togglebutton40 (see GCBO)
% eventdata reserved - to be defined in a future version of MATLAB
% handles structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of togglebutton40

% --- Executes on button press in togglebutton41.
function togglebutton41_Callback(hObject, eventdata, handles)
% hObject handle to togglebutton41 (see GCBO)
% eventdata reserved - to be defined in a future version of MATLAB
% handles structure with handles and user data (see GUIDATA)
% Hint: get(hObject,'Value') returns toggle state of togglebutton41

% --- Executes on button press in togglebutton42.
function togglebutton42_Callback(hObject, eventdata, handles)
% hObject handle to togglebutton42 (see GCBO)
% eventdata reserved - to be defined in a future version of MATLAB
% handles structure with handles and user data (see GUIDATA)
% Hint: get(hObject,'Value') returns toggle state of togglebutton42

% --- Executes on button press in RL.
function RL_Callback(hObject, eventdata, handles)
% hObject handle to RL (see GCBO)
% eventdata reserved - to be defined in a future version of MATLAB
% handles structure with handles and user data (see GUIDATA)
% Hint: get(hObject,'Value') returns toggle state of RL

% --- Executes on button press in togglebutton43.
function togglebutton43_Callback(hObject, eventdata, handles)
% hObject handle to togglebutton43 (see GCBO)
% eventdata reserved - to be defined in a future version of MATLAB
% handles structure with handles and user data (see GUIDATA)
% Hint: get(hObject,'Value') returns toggle state of togglebutton43

function Io_Callback(hObject, eventdata, handles)
% hObject handle to Io (see GCBO)
% eventdata reserved - to be defined in a future version of MATLAB
% handles structure with handles and user data (see GUIDATA)
% Hints: get(hObject,'String') returns contents of Io as text
% str2double(get(hObject,'String')) returns contents of Io as a double

handles.Io=str2double(get(hObject,'String'));
if isnan(handles.Io)
    errordlg('you must enter a numeric value','Error')
end
guidata(hObject,handles)

% --- Executes during object creation, after setting all properties.
function Io_CreateFcn(hObject, eventdata, handles)
% hObject handle to Io (see GCBO)
% eventdata reserved - to be defined in a future version of MATLAB

% eventdata reserved - to be defined in a future version of MATLAB
% handles structure with handles and user data (see GUIDATA)
% handles    empty - handles not created until after all CreateFcns called

% Hint: edit controls usually have a white background on Windows.  %    See ISPC and COMPUTER.
if ispc && isequal(get(hObject,'BackgroundColor'),
    get(0,'defaultUicontrolBackgroundColor'))
    set(hObject,'BackgroundColor','white');
end

% --- Executes on button press in pushbutton18.
function pushbutton18_Callback(hObject, eventdata, handles)
    % hObject    handle to pushbutton18 (see GCBO)
    % eventdata  reserved - to be defined in a future version of MATLAB
    % handles    structure with handles and user data (see GUIDATA)
    function MVA_Callback(hObject, eventdata, handles)
    % hObject    handle to MVA (see GCBO)
    % eventdata  reserved - to be defined in a future version of MATLAB
    % handles    structure with handles and user data (see GUIDATA)
    % Hints: get(hObject,'String') returns contents of MVA as text
    %        str2double(get(hObject,'String')) returns contents of MVA as a double
    handles.MVA=str2double(get(hObject,'string'));
    if isnan(handles.MVA)
        errordlg('you must enter a numeric value','Error')
    end
    guidata(hObject,handles)

% --- Executes during object creation, after setting all properties.
function MVA_CreateFcn(hObject, eventdata, handles)
    % hObject    handle to MVA (see GCBO)
    % eventdata  reserved - to be defined in a future version of MATLAB
    % handles    empty - handles not created until after all CreateFcns called
    % Hint: edit controls usually have a white background on Windows.  %    See ISPC and COMPUTER.
    if ispc && isequal(get(hObject,'BackgroundColor'),
        get(0,'defaultUicontrolBackgroundColor'))
        set(hObject,'BackgroundColor','white');
    end

% --- Executes on button press in togglebutton44.
function togglebutton44_Callback(hObject, eventdata, handles)
    % hObject    handle to togglebutton44 (see GCBO)
    % eventdata  reserved - to be defined in a future version of MATLAB
    % handles    structure with handles and user data (see GUIDATA)
    % Hint: get(hObject,'Value') returns toggle state of togglebutton44

% --- Executes on button press in togglebutton45.
function togglebutton45_Callback(hObject, eventdata, handles)
    % hObject    handle to togglebutton45 (see GCBO)
    % eventdata  reserved - to be defined in a future version of MATLAB
    % handles    structure with handles and user data (see GUIDATA)
% Hint: get(hObject,'Value') returns toggle state of togglebutton45

% --- Executes on button press in togglebutton46.
function togglebutton46_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton46 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of togglebutton46

% --- Executes on button press in togglebutton47.
function togglebutton47_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton47 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of togglebutton47

% --- Executes on button press in togglebutton48.
function togglebutton48_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton48 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of togglebutton48

% --- Executes on button press in togglebutton49.
function togglebutton49_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton49 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of togglebutton49

% --- Executes on button press in togglebutton50.
function togglebutton50_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton50 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of togglebutton50

% --- Executes on button press in togglebutton52.
function togglebutton52_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton52 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of togglebutton52

% --- Executes on button press in togglebutton53.
function togglebutton53_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton53 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)
% Hint: get(hObject,'Value') returns toggle state of togglebutton53

% --- Executes on button press in togglebutton55.
function togglebutton55_Callback(hObject, eventdata, handles)
    hObject    handle to togglebutton55 (see GCBO)
    eventdata  reserved - to be defined in a future version of MATLAB
    handles    structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of togglebutton55

% --- Executes on button press in ALF20.
function ALF20_Callback(hObject, eventdata, handles)
    hObject    handle to ALF20 (see GCBO)
    eventdata  reserved - to be defined in a future version of MATLAB
    handles    structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of ALF20
handles.ALF20=str2double(get(hObject,'string'));
if isnan(handles.ALF20)
    errordlg('you must enter a numeric value','Error')
end
guidata(hObject,handles)

% --- Executes on button press in Vknee20.
function Vknee20_Callback(hObject, eventdata, handles)
    hObject    handle to Vknee20 (see GCBO)
    eventdata  reserved - to be defined in a future version of MATLAB
    handles    structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of Vknee20
handles.Vknee20=str2double(get(hObject,'string'));
if isnan(handles.Vknee20)
    errordlg('you must enter a numeric value','Error')
end
guidata(hObject,handles)

% --- Executes on button press in togglebutton58.
function togglebutton58_Callback(hObject, eventdata, handles)
    hObject    handle to togglebutton58 (see GCBO)
    eventdata  reserved - to be defined in a future version of MATLAB
    handles    structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of togglebutton58

% --- Executes on button press in VA20.
function VA20_Callback(hObject, eventdata, handles)
    hObject    handle to VA20 (see GCBO)
    eventdata  reserved - to be defined in a future version of MATLAB
    handles    structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of VA20
handles.VA20=str2double(get(hObject,'string'));
if isnan(handles.VA20)
    errordlg('you must enter a numeric value','Error')
end
guida(hObject,handles)

% --- Executes on button press in togglebutton60.
function togglebutton60_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton60 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)
% Hint: get(hObject,'Value') returns toggle state of togglebutton60

% --- Executes on button press in togglebutton61.
function togglebutton61_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton61 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)
% Hint: get(hObject,'Value') returns toggle state of togglebutton61

% --- Executes on button press in togglebutton62.
function togglebutton62_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton62 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)
% Hint: get(hObject,'Value') returns toggle state of togglebutton62

% --- Executes on button press in togglebutton63.
function togglebutton63_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton63 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)
% Hint: get(hObject,'Value') returns toggle state of togglebutton63

% --- Executes on button press in togglebutton64.
function togglebutton64_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton64 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)
% Hint: get(hObject,'Value') returns toggle state of togglebutton64

% --- Executes on button press in togglebutton65.
function togglebutton65_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton65 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)
% Hint: get(hObject,'Value') returns toggle state of togglebutton65

% --- Executes on button press in togglebutton66.
function togglebutton66_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton66 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)
% Hint: get(hObject,'Value') returns toggle state of togglebutton66
% --- Executes on button press in togglebutton67.
function togglebutton67_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton67 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of togglebutton67

% --- Executes on button press in togglebutton68.
function togglebutton68_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton68 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of togglebutton68

function status_Callback(hObject, eventdata, handles)
% hObject    handle to status (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hints: get(hObject,'String') returns contents of status as text
%        str2double(get(hObject,'String')) returns contents of status as a double

% --- Executes during object creation, after setting all properties.
function status_CreateFcn(hObject, eventdata, handles)
% hObject    handle to status (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    empty - handles not created until after all CreateFcns called

% Hint: edit controls usually have a white background on Windows.
% See ISPC and COMPUTER.
if ispc && isequal(get(hObject,'BackgroundColor'), get(0,'defaultUicontrolBackgroundColor'))
    set(hObject,'BackgroundColor','white');
end

function Ohm_Callback(hObject, eventdata, handles)
% hObject    handle to Ohm (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hints: get(hObject,'String') returns contents of Ohm as text
%        str2double(get(hObject,'String')) returns contents of Ohm as a double
handles.Ohm=str2double(get(hObject,'string'));
if isnan(handles.Ohm)
    errordlg('you must enter a numeric value','Error')
end
guidata(hObject,handles)

% --- Executes during object creation, after setting all properties.
function Ohm_CreateFcn(hObject, eventdata, handles)
% hObject    handle to Ohm (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    empty - handles not created until after all CreateFcns called
% Hint: edit controls usually have a white background on Windows.
% See ISPC and COMPUTER.
if ispc && isequal(get(hObject,'BackgroundColor'),
get(0,'defaultUicontrolBackgroundColor'))
    set(hObject,'BackgroundColor','white');
end

% --- Executes during object creation, after setting all properties.
function ALF20_CreateFcn(hObject, eventdata, handles)
% hObject    handle to ALF20 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    empty - handles not created until after all CreateFcns
% called
% Hint: edit controls usually have a white background on Windows.
% See ISPC and COMPUTER.
if ispc && isequal(get(hObject,'BackgroundColor'),
get(0,'defaultUicontrolBackgroundColor'))
    set(hObject,'BackgroundColor','white');
end

% --- Executes during object creation, after setting all properties.
function Vknee20_CreateFcn(hObject, eventdata, handles)
% hObject    handle to Vknee20 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    empty - handles not created until after all CreateFcns
% called
% Hint: edit controls usually have a white background on Windows.
% See ISPC and COMPUTER.
if ispc && isequal(get(hObject,'BackgroundColor'),
get(0,'defaultUicontrolBackgroundColor'))
    set(hObject,'BackgroundColor','white');
end

% --- Executes during object creation, after setting all properties.
function VA20_CreateFcn(hObject, eventdata, handles)
% hObject    handle to VA20 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    empty - handles not created until after all CreateFcns
% called
% Hint: edit controls usually have a white background on Windows.
% See ISPC and COMPUTER.
if ispc && isequal(get(hObject,'BackgroundColor'),
get(0,'defaultUicontrolBackgroundColor'))
    set(hObject,'BackgroundColor','white');
end

% --- Executes on button press in togglebutton69.
function togglebutton69_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton69 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)
% Hint: get(hObject,'Value') returns toggle state of togglebutton69
function edit25_Callback(hObject, eventdata, handles)
    % hObject    handle to VA20 (see GCBO)
    % eventdata  reserved - to be defined in a future version of MATLAB
    % handles    structure with handles and user data (see GUIDATA)

    % Hints: get(hObject,'String') returns contents of VA20 as text
    %        str2double(get(hObject,'String')) returns contents of VA20 as a double

    % --- Executes during object creation, after setting all properties.
    function edit25_CreateFcn(hObject, eventdata, handles)
        % hObject    handle to VA20 (see GCBO)
        % eventdata  reserved
        %            - to be defined in a future version of MATLAB
        % handles    empty - handles not created until after all CreateFcns called

        % Hint: edit controls usually have a white background on Windows.
        % See ISPC and COMPUTER.
        if ispc && isequal(get(hObject,'BackgroundColor'),
            get(0,'defaultUicontrolBackgroundColor'))
            set(hObject,'BackgroundColor','white');
        end

    % --- Executes on button press in togglebutton71.
    function togglebutton71_Callback(hObject, eventdata, handles)
        % hObject    handle to togglebutton71 (see GCBO)
        % eventdata  reserved - to be defined in a future version of MATLAB
        % handles    structure with handles and user data (see GUIDATA)

        % Hint: get(hObject,'Value') returns toggle state of togglebutton71

    % --- Executes on button press in togglebutton72.
    function togglebutton72_Callback(hObject, eventdata, handles)
        % hObject    handle to togglebutton72 (see GCBO)
        % eventdata  reserved - to be defined in a future version of MATLAB
        % handles    structure with handles and user data (see GUIDATA)

        % Hint: get(hObject,'Value') returns toggle state of togglebutton72

    % --- Executes on button press in togglebutton73.
    function togglebutton73_Callback(hObject, eventdata, handles)
        % hObject    handle to togglebutton73 (see GCBO)
        % eventdata  reserved - to be defined in a future version of MATLAB
        % handles    structure with handles and user data (see GUIDATA)

        % Hint: get(hObject,'Value') returns toggle state of togglebutton73

    % --- Executes on button press in togglebutton74.
    function togglebutton74_Callback(hObject, eventdata, handles)
        % hObject    handle to togglebutton74 (see GCBO)
        % eventdata  reserved - to be defined in a future version of MATLAB
        % handles    structure with handles and user data (see GUIDATA)

        % Hint: get(hObject,'Value') returns toggle state of togglebutton74

    % --- Executes on button press in togglebutton75.
    function togglebutton75_Callback(hObject, eventdata, handles)
        % hObject    handle to togglebutton75 (see GCBO)
% eventdata reserved - to be defined in a future version of MATLAB
% handles structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of togglebutton75
% --- Executes on button press in togglebutton76.
function togglebutton76_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton76 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)
% Hint: get(hObject,'Value') returns toggle state of togglebutton76

% --- Executes on button press in togglebutton77.
function togglebutton77_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton77 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)
% Hint: get(hObject,'Value') returns toggle state of togglebutton77

% --- Executes on button press in togglebutton78.
function togglebutton78_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton78 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)
% Hint: get(hObject,'Value') returns toggle state of togglebutton78

% --- Executes on button press in togglebutton79.
function togglebutton79_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton79 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)
% Hint: get(hObject,'Value') returns toggle state of togglebutton79

% --- Executes on button press in togglebutton80.
function togglebutton80_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton80 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)
% Hint: get(hObject,'Value') returns toggle state of togglebutton80

% --- Executes on button press in togglebutton81.
function togglebutton81_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton81 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)
% Hint: get(hObject,'Value') returns toggle state of togglebutton81

% --- Executes on button press in togglebutton82.
function togglebutton82_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton82 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)
% Hint: get(hObject,'Value') returns toggle state of togglebutton82
% --- Executes on button press in togglebutton83.
function togglebutton83_Callback(hObject, eventdata, handles)
    % hObject    handle to togglebutton83 (see GCBO)
    % eventdata  reserved - to be defined in a future version of MATLAB
    % handles    structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of togglebutton83
% --- Executes on button press in togglebutton84.
function togglebutton84_Callback(hObject, eventdata, handles)
    % hObject    handle to togglebutton84 (see GCBO)
    % eventdata  reserved - to be defined in a future version of MATLAB
    % handles    structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of togglebutton84
% --- Executes on button press in togglebutton85.
function togglebutton85_Callback(hObject, eventdata, handles)
    % hObject    handle to togglebutton85 (see GCBO)
    % eventdata  reserved - to be defined in a future version of MATLAB
    % handles    structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of togglebutton85
% --- Executes on button press in togglebutton86.
function togglebutton86_Callback(hObject, eventdata, handles)
    % hObject    handle to togglebutton86 (see GCBO)
    % eventdata  reserved - to be defined in a future version of MATLAB
    % handles    structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of togglebutton86
% --- Executes on button press in togglebutton87.
function togglebutton87_Callback(hObject, eventdata, handles)
    % hObject    handle to togglebutton87 (see GCBO)
    % eventdata  reserved - to be defined in a future version of MATLAB
    % handles    structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of togglebutton87
% --- Executes on button press in togglebutton88.
function togglebutton88_Callback(hObject, eventdata, handles)
    % hObject    handle to togglebutton88 (see GCBO)
    % eventdata  reserved - to be defined in a future version of MATLAB
    % handles    structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of togglebutton88
% --- Executes on button press in togglebutton89.
function togglebutton89_Callback(hObject, eventdata, handles)
    % hObject    handle to togglebutton89 (see GCBO)
    % eventdata  reserved - to be defined in a future version of MATLAB
    % handles    structure with handles and user data (see GUIDATA)
% Hint: get(hObject,'Value') returns toggle state of togglebutton89

% --- Executes on button press in togglebutton90.
function togglebutton90_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton90 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of togglebutton90

% --- Executes on button press in togglebutton91.
function togglebutton91_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton91 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of togglebutton91

% --- Executes on button press in togglebutton92.
function togglebutton92_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton92 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of togglebutton92

% --- Executes on button press in togglebutton93.
function togglebutton93_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton93 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of togglebutton93

% --- Executes on button press in togglebutton94.
function togglebutton94_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton94 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of togglebutton94

% --- Executes on button press in togglebutton95.
function togglebutton95_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton95 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of togglebutton95

% --- Executes on button press in togglebutton96.
function togglebutton96_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton96 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of togglebutton96
% --- Executes on button press in togglebutton97.
function togglebutton97_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton97 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of togglebutton97

% --- Executes on button press in togglebutton98.
function togglebutton98_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton98 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of togglebutton98

% --- Executes on button press in togglebutton99.
function togglebutton99_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton99 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of togglebutton99

% --- Executes on button press in pushbutton23.
function pushbutton23_Callback(hObject, eventdata, handles)
% hObject    handle to pushbutton23 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

x1=[0.0010 0.0020 0.0040 0.0050 0.0080 0.0100 0.0200 0.0400 0.0500
0.0800 0.1000 0.2000 0.4000 0.5000 0.8000 1.0000]
y1=[1.6 3.8 10.6 16.0 29.4 444.2 459.6 491.3 511.6 517.8 530.1 536.0]
y2=[2.2 4.0 13.2 17.2 33.0 45.0 118.1 316.4 387.6 464.8 480.8 510.3
529.3 534.8 546.2 552.1]
y3=[2.1 4.1 13.5 19.8 36.9 49.8 134.6 357.5 423.1 482.4 494.9 519.0
536.4 541.2 552.6 558.7]

figure
ax1=axes('FontSize',13)
loglog(x1,y1,'-r','LineWidth',1.0,'MarkerEdgeColor','r','MarkerFaceColor','g','MarkerSize',2)
hold on
loglog(x1,y2,'-r','LineWidth',1.0,'MarkerEdgeColor','r','MarkerFaceColor','r','MarkerSize',2)
hold on
loglog(x1,y3,'-r','LineWidth',1.0,'MarkerEdgeColor','r','MarkerFaceColor','w','MarkerSize',2)
hold off
h = legend('Red Phase','Yellow Phase','Blue Phase',10);
grid on
xlabel({'Current in mA';'Current'})
ylabel({'Voltage in V'; 'Voltage'})
title('CT SATURATION PLOT', 'fontsize', 15, 'fontweight', 'b');
text(0.0580, 350.1, '(0.0580, 408.1)', 'FontSize', 10, 'fontweight', 'b')
text(0.0700, 400.1, '(0.0592, 427.4)', 'FontSize', 10, 'fontweight', 'b')
text(0.0700, 500.1, '(0.0524, 4432.7)', 'FontSize', 10, 'fontweight', 'b')
text(0.01, 14, 'ASA 10/50Vkp: CT R = 408.1 V; CT Y = 427.4 V; CT B = 432.7 V', 'FontSize', 12, 'fontweight', 'b')
text(0.01, 11, 'Vkp = 204.05 V; 213.7 V; 216.35 V', 'FontSize', 12, 'fontweight', 'b')
function varargout = core1(varargin)
% CORE1 M-file for core1.fig
%    CORE1, by itself, creates a new CORE1 or raises the existing
%    singleton*.  
%    H = CORE1 returns the handle to a new CORE1 or the handle to
%    the existing singleton*.  
%    CORE1('CALLBACK',hObject,eventData,handles,...) calls the local
%    function named CALLBACK in CORE1.M with the given input
%    arguments.  
%    CORE1('Property','Value',...) creates a new CORE1 or raises the
%    existing singleton*.  Starting from the left, property value
%    pairs are
%    applied to the GUI before core1_OpeningFunction gets called.  An
%    unrecognized property name or invalid value makes property
%    application
%    stop.  All inputs are passed to core1_OpeningFcn via varargin.
%    *See GUI Options on GUIDE's Tools menu.  Choose "GUI allows only
%    one
%    instance to run (singleton)".

% See also: GUIDE, GUIDATA, GUIHANDLES

% Edit the above text to modify the response to help core1

% Last Modified by GUIDE v2.5 12-Nov-2009 15:30:07

% Begin initialization code - DO NOT EDIT
gui_Singleton = 1;
gui_State = struct('gui_Name', mfilename, ...
    'gui_Singleton', gui_Singleton, ...
    'gui_OpeningFcn', @core1_OpeningFcn, ...
    'gui_OutputFcn', @core1_OutputFcn, ...
    'gui_LayoutFcn', [], ..., ...
    'gui_Callback', []);
if nargin && ischar(varargin{1})
    gui_State.gui_Callback = str2func(varargin{1});
end

if nargout
    [varargout{1:nargout}] = gui_mainfcn(gui_State, varargin{:});
else
    gui_mainfcn(gui_State, varargin{:});
end
% End initialization code - DO NOT EDIT
% --- Executes just before core1 is made visible.
function core1_OpeningFcn(hObject, eventdata, handles, varargin)
% This function has no output args, see OutputFcn.
% hObject    handle to figure
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)
% varargin   command line arguments to core1 (see VARARGIN)
backgroundImage = importdata('mcag34.jpg');
axes(handles.mcag34_pic);
image(backgroundImage);
axis off

%backgroundImage = importdata('kbch130.jpg');
%axes(handles.Kbch130_pic);
%image(backgroundImage);
%axis off

% Choose default command line output for core1
handles.output = hObject;

% Update handles structure
guidata(hObject, handles);

% UIWAIT makes core1 wait for user response (see UIRESUME)
% uiswait(handles.figure1);

% --- Outputs from this function are returned to the command line.
function varargout = core1_OutputFcn(hObject, eventdata, handles)
% varargout  cell array for returning output args (see VARARGOUT);
% hObject    handle to figure
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Get default command line output from handles structure
varargout{1} = handles.output;

function edit1_Callback(hObject, eventdata, handles)
% hObject    handle to edit1 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hints: get(hObject,'String') returns contents of edit1 as text
% str2double(get(hObject,'String')) returns contents of edit1 as a double

% --- Executes during object creation, after setting all properties.
function edit1_CreateFcn(hObject, eventdata, handles)
% hObject    handle to edit1 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    empty - handles not created until after all CreateFcns called

% Hint: edit controls usually have a white background on Windows.
% See ISPC and COMPUTER.
if ispc && isequal(get(hObject,'BackgroundColor'),
get(0,'defaultUicontrolBackgroundColor'))
set(hObject, 'BackgroundColor', 'white');
end

function Ip1_Callback(hObject, eventdata, handles)
    % hObject    handle to Ip1 (see GCBO)
    % eventdata  reserved - to be defined in a future version of MATLAB
    % handles    structure with handles and user data (see GUIDATA)

    % Hints: get(hObject,'String') returns contents of Ip1 as text
    %        str2double(get(hObject,'String')) returns contents of Ip1 as a
double

    handles.Ip1=str2double(get(hObject, 'string'));
    if isnan(handles.Ip1)
        errordlg('you must enter a numeric value', 'Error')
    end
    guidata(hObject,handles)

end

function Ip2_Callback(hObject, eventdata, handles)
    % hObject    handle to Ip2 (see GCBO)
    % eventdata  reserved - to be defined in a future version of MATLAB
    % handles    structure with handles and user data (see GUIDATA)

    % Hints: get(hObject,'String') returns contents of Ip2 as text
    %        str2double(get(hObject,'String')) returns contents of Ip2 as a
double

    handles.Ip2=str2double(get(hObject, 'string'));
    if isnan(handles.Ip2)
        errordlg('you must enter a numeric value', 'Error')
    end
    guidata(hObject,handles)

end

function Ip1_CreateFcn(hObject, eventdata, handles)
    % hObject    handle to Ip1 (see GCBO)
    % eventdata  reserved - to be defined in a future version of MATLAB
    % handles    empty - handles not created until after all CreateFcns
called

    % Hint: edit controls usually have a white background on Windows.
    %       See ISPC and COMPUTER.
    if ispc && isequal(get(hObject,'BackgroundColor'),
                      get(0,'defaultUicontrolBackgroundColor'))
        set(hObject, 'BackgroundColor', 'white');
    end
end

function Ip2_CreateFcn(hObject, eventdata, handles)
    % hObject    handle to Ip2 (see GCBO)
    % eventdata  reserved - to be defined in a future version of MATLAB
    % handles    empty - handles not created until after all CreateFcns
called

    % Hint: edit controls usually have a white background on Windows.
    %       See ISPC and COMPUTER.
if ispc && isequal(get(hObject,'BackgroundColor'),
    get(0,'defaultUicontrolBackgroundColor'))
    set(hObject,'BackgroundColor','white');
end

function Ip3_Callback(hObject, eventdata, handles)
% hObject    handle to Ip3 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hints: get(hObject,'String') returns contents of Ip3 as text
%       str2double(get(hObject,'String')) returns contents of Ip3 as a
double

handles.Ip3=str2double(get(hObject,'string'));
if isnan(handles.Ip3)
    errordlg('you must enter a numeric value','Error')
end
guidata(hObject,handles)

% --- Executes during object creation, after setting all properties.
function Ip3_CreateFcn(hObject, eventdata, handles)
% hObject    handle to Ip3 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    empty - handles not created until after all CreateFcns
called

% Hint: edit controls usually have a white background on Windows.
%       See ISPC and COMPUTER.
if ispc && isequal(get(hObject,'BackgroundColor'),
    get(0,'defaultUicontrolBackgroundColor'))
    set(hObject,'BackgroundColor','white');
end

function Io_Callback(hObject, eventdata, handles)
% hObject    handle to Io (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hints: get(hObject,'String') returns contents of Io as text
%       str2double(get(hObject,'String')) returns contents of Io as a
double

handles.Io=str2double(get(hObject,'string'));
if isnan(handles.Io)
    errordlg('you must enter a numeric value','Error')
end
guidata(hObject,handles)

% --- Executes during object creation, after setting all properties.
function Io_CreateFcn(hObject, eventdata, handles)
% hObject    handle to Io (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    empty - handles not created until after all CreateFcns
called

% Hint: edit controls usually have a white background on Windows.
% See ISPC and COMPUTER.
if ispc && isequal(get(hObject,'BackgroundColor'),
                get(0,'defaultUicontrolBackgroundColor'))
    set(hObject,'BackgroundColor','white');
end

function Rr_Callback(hObject, eventdata, handles)
    % hObject    handle to Rr (see GCBO)
    % eventdata  reserved - to be defined in a future version of MATLAB
    % handles    structure with handles and user data (see GUIDATA)

    % Hints: get(hObject,'String') returns contents of Rr as text
    %        str2double(get(hObject,'String')) returns contents of Rr as a
double
    handles.Rr=str2double(get(hObject,'String'));
    if isnan(handles.Rr)
        errordlg('you must enter a numeric value','Error')
    end
    guidata(hObject,handles)

% --- Executes during object creation, after setting all properties.
function Rr_CreateFcn(hObject, eventdata, handles)
    % hObject    handle to Rr (see GCBO)
    % eventdata  reserved - to be defined in a future version of MATLAB
    % handles    empty - handles not created until after all CreateFcns
called

    % Hint: edit controls usually have a white background on Windows.
    % See ISPC and COMPUTER.
    if ispc && isequal(get(hObject,'BackgroundColor'),
                get(0,'defaultUicontrolBackgroundColor'))
        set(hObject,'BackgroundColor','white');
    end

function VA1_Callback(hObject, eventdata, handles)
    % hObject    handle to VA1 (see GCBO)
    % eventdata  reserved - to be defined in a future version of MATLAB
    % handles    structure with handles and user data (see GUIDATA)

    % Hints: get(hObject,'String') returns contents of VA1 as text
    %        str2double(get(hObject,'String')) returns contents of VA1 as a
double
    handles.VA1=str2double(get(hObject,'String'));
    if isnan(handles.VA1)
        errordlg('you must enter a numeric value','Error')
    end
    guidata(hObject,handles)

% --- Executes during object creation, after setting all properties.
function VA1_CreateFcn(hObject, eventdata, handles)
    % hObject    handle to VA1 (see GCBO)
    % eventdata  reserved - to be defined in a future version of MATLAB
    % handles    empty - handles not created until after all CreateFcns
called

if ispc && isequal(get(hObject,'BackgroundColor'),get(0,'defaultUicontrolBackgroundColor'))
    set(hObject,'BackgroundColor','white');
end

% --- Executes on button press in pushbutton1.
function pushbutton1_Callback(hObject, eventdata, handles)
% hObject    handle to pushbutton1 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% To calculate highest CT Secondary resistance
Rct1=(handles.Ip1)*(handles.Ohm);
set(handles.Rct1,'string',Rct1);

% To calculate Lowest CT Secondary resistance
Rct2=(handles.Ip2)*(handles.Ohm);
set(handles.Rct2,'string',Rct2);

% To calculate full load current in secondary
Ip=(handles.MVA*1000000)/((handles.Vs*1000)*sqrt(3));
Is1=Ip/(handles.Ip1);
set(handles.Is1,'string',Is1);

% To calculate full load current in secondary
Is2=Ip/(handles.Ip2);
set(handles.Is2,'string',Is2);

% to calculate the Ext.Fault Current for 1st ratio
Iefc1=16*Is1;
set(handles.Iefc1,'string',Iefc1);

% to calculate the Ext.Fault Current for 2nd ratio
Iefc2=16*Is2;
set(handles.Iefc2,'string',Iefc2);

% To calculate Knee point Voltage
RL=2*(handles.Ic)*(handles.Cr);
Vknee=(3)*(Iefc1)*(Rct1+RL);
set(handles.Vknee,'string',Vknee);

% To calculate 2nd ratio Knee point Voltage
Vknee2=(3)*(Iefc2)*(Rct2+RL);
set(handles.Vknee2,'string',Vknee2);

% To calculate the Actual Connected resistance
Rb=RL+(handles.Rr);
set(handles.Rb,'string',Rb);

% To calculate Accurate Burden
VA=(Vknee(handles.ALF)-Rct1);
set(handles.VA,'string',VA);

% To calculate 2nd ratio Accurate Burden
VA3=(Vknee2(handles.ALF)-Rct2);
set(handles.VA3,'string',VA3);
function Vs_Callback(hObject, eventdata, handles)
% hObject    handle to Vs (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hints: get(hObject,'String') returns contents of Vs as text
%        str2double(get(hObject,'String')) returns contents of Vs as a double

handles.Vs=str2double(get(hObject,'String'));
if isnan(handles.Vs)
    errordlg('you must enter a numeric value','Error')
end
guidata(hObject,handles)

% --- Executes during object creation, after setting all properties.
function Vs_CreateFcn(hObject, eventdata, handles)
% hObject    handle to Vs (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    empty - handles not created until after all CreateFcns called

% Hint: edit controls usually have a white background on Windows.
%       See ISPC and COMPUTER.
if ispc && isequal(get(hObject,'BackgroundColor'),
    get(0,'defaultUicontrolBackgroundColor'))
    set(hObject,'BackgroundColor','white');
end

function If_Callback(hObject, eventdata, handles)
% hObject    handle to If (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hints: get(hObject,'String') returns contents of If as text
%        str2double(get(hObject,'String')) returns contents of If as a double

handles.If=str2double(get(hObject,'String'));
if isnan(handles.If)
    errordlg('you must enter a numeric value','Error')
end
guidata(hObject,handles)

% --- Executes during object creation, after setting all properties.
function If_CreateFcn(hObject, eventdata, handles)
% hObject    handle to If (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    empty - handles not created until after all CreateFcns called

% Hint: edit controls usually have a white background on Windows.
%       See ISPC and COMPUTER.
if ispc && isequal(get(hObject,'BackgroundColor'),
    get(0,'defaultUicontrolBackgroundColor'))
    set(hObject,'BackgroundColor','white');
end
function f_Callback(hObject, eventdata, handles)
% hObject    handle to f (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hints: get(hObject,'String') returns contents of f as text
%        str2double(get(hObject,'String')) returns contents of f as a double

handles.f=str2double(get(hObject,'string'));
if isnan(handles.f)
    errordlg('you must enter a numeric value','Error')
end
guidata(hObject,handles)

% --- Executes during object creation, after setting all properties.
function f_CreateFcn(hObject, eventdata, handles)
% hObject    handle to f (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    empty - handles not created until after all CreateFcns called

% Hint: edit controls usually have a white background on Windows.
%       See ISPC and COMPUTER.
if ispc && isequal(get(hObject,'BackgroundColor'),
                   get(0,'defaultUicontrolBackgroundColor'))
    set(hObject,'BackgroundColor','white');
end

function Ic_Callback(hObject, eventdata, handles)
% hObject    handle to Ic (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hints: get(hObject,'String') returns contents of Ic as text
%        str2double(get(hObject,'String')) returns contents of Ic as a double

handles.Ic=str2double(get(hObject,'string'));
if isnan(handles.Ic)
    errordlg('you must enter a numeric value','Error')
end
guidata(hObject,handles)

% --- Executes during object creation, after setting all properties.
function Ic_CreateFcn(hObject, eventdata, handles)
% hObject    handle to Ic (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    empty - handles not created until after all CreateFcns called

% Hint: edit controls usually have a white background on Windows.
%       See ISPC and COMPUTER.
if ispc && isequal(get(hObject,'BackgroundColor'),
                   get(0,'defaultUicontrolBackgroundColor'))
    set(hObject,'BackgroundColor','white');
end
function Cc_Callback(hObject, eventdata, handles)

% hObject    handle to Cc (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hints: get(hObject,'String') returns contents of Cc as text
%        str2double(get(hObject,'String')) returns contents of Cc as a double

handles.Cc = str2double(get(hObject,'String'));
if isnan(handles.Cc)
    errordlg('you must enter a numeric value','Error')
end

guidata(hObject,handles)

% --- Executes during object creation, after setting all properties.
function Cc_CreateFcn(hObject, eventdata, handles)

% hObject    handle to Cc (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    empty - handles not created until after all CreateFcns called

% Hint: edit controls usually have a white background on Windows.
%       See ISPC and COMPUTER.
if ispc && isequal(get(hObject,'BackgroundColor'),
    get(0,'defaultUicontrolBackgroundColor'))
    set(hObject,'BackgroundColor','white');
end

function Cr_Callback(hObject, eventdata, handles)

% hObject    handle to Cr (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hints: get(hObject,'String') returns contents of Cr as text
%        str2double(get(hObject,'String')) returns contents of Cr as a double

handles.Cr = str2double(get(hObject,'String'));
if isnan(handles.Cr)
    errordlg('you must enter a numeric value','Error')
end

guidata(hObject,handles)

% --- Executes during object creation, after setting all properties.
function Cr_CreateFcn(hObject, eventdata, handles)

% hObject    handle to Cr (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    empty - handles not created until after all CreateFcns called

% Hint: edit controls usually have a white background on Windows.
%       See ISPC and COMPUTER.
if ispc && isequal(get(hObject,'BackgroundColor'),
    get(0,'defaultUicontrolBackgroundColor'))
    set(hObject,'BackgroundColor','white');
function Xr_Callback(hObject, eventdata, handles)
% hObject    handle to Xr (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hints: get(hObject,'String') returns contents of Xr as text
%        str2double(get(hObject,'String')) returns contents of Xr as a
double

handles.Xr=str2double(get(hObject,'String'));
if isnan(handles.Xr)
    errordlg('you must enter a numeric value','Error')
end
guidata(hObject,handles)

% --- Executes during object creation, after setting all properties.
function Xr_CreateFcn(hObject, eventdata, handles)
% hObject    handle to Xr (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    empty - handles not created until after all CreateFcns
%               called

% Hint: edit controls usually have a white background on Windows.
%       See ISPC and COMPUTER.
if ispc && isequal(get(hObject,'BackgroundColor'),
    get(0,'defaultUicontrolBackgroundColor'))
    set(hObject,'BackgroundColor','white');
end

function L_Callback(hObject, eventdata, handles)
% hObject    handle to L (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hints: get(hObject,'String') returns contents of L as text
%        str2double(get(hObject,'String')) returns contents of L as a
double

handles.L=str2double(get(hObject,'String'));
if isnan(handles.L)
    errordlg('you must enter a numeric value','Error')
end
guidata(hObject,handles)

% --- Executes during object creation, after setting all properties.
function L_CreateFcn(hObject, eventdata, handles)
% hObject    handle to L (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    empty - handles not created until after all CreateFcns
%               called

% Hint: edit controls usually have a white background on Windows.
%       See ISPC and COMPUTER.
if ispc && isequal(get(hObject,'BackgroundColor'),
    get(0,'defaultUicontrolBackgroundColor'))
function Ohm_Callback(hObject, eventdata, handles)
% hObject handle to Ohm (see GCBO)
% eventdata reserved - to be defined in a future version of MATLAB
% handles structure with handles and user data (see GUIDATA)

% Hints: get(hObject,'String') returns contents of Ohm as text
% str2double(get(hObject,'String')) returns contents of Ohm as a double

handles.Ohm=str2double(get(hObject,'string'));
if isnan(handles.Ohm)
    errordlg('you must enter a numeric value','Error')
end

guidata(hObject,handles)

% --- Executes during object creation, after setting all properties.
function Ohm_CreateFcn(hObject, eventdata, handles)
% hObject handle to Ohm (see GCBO)
% eventdata reserved - to be defined in a future version of MATLAB
% handles empty - handles not created until after all CreateFcns called

% Hint: edit controls usually have a white background on Windows.
% See ISPC and COMPUTER.
if ispc && isequal(get(hObject,'BackgroundColor'),
    get(0,'defaultUicontrolBackgroundColor'))
    set(hObject,'BackgroundColor','white');
end

function Kr_Callback(hObject, eventdata, handles)
% hObject handle to Kr (see GCBO)
% eventdata reserved - to be defined in a future version of MATLAB
% handles structure with handles and user data (see GUIDATA)

% Hints: get(hObject,'String') returns contents of Kr as text
% str2double(get(hObject,'String')) returns contents of Kr as a double

handles.Kr=str2double(get(hObject,'string'));
if isnan(handles.Kr)
    errordlg('you must enter a numeric value','Error')
end

guidata(hObject,handles)

% --- Executes during object creation, after setting all properties.
function Kr_CreateFcn(hObject, eventdata, handles)
% hObject handle to Kr (see GCBO)
% eventdata reserved - to be defined in a future version of MATLAB
% handles empty - handles not created until after all CreateFcns called

% Hint: edit controls usually have a white background on Windows.
% See ISPC and COMPUTER.
if ispc && isequal(get(hObject,'BackgroundColor'),
    get(0,'defaultUicontrolBackgroundColor'))
    set(hObject,'BackgroundColor','white');
end

function ALF_Callback(hObject, eventdata, handles)
    % hObject    handle to ALF (see GCBO)
    % eventdata  reserved - to be defined in a future version of MATLAB
    % handles    structure with handles and user data (see GUIDATA)
    
    % Hints: get(hObject,'String') returns contents of ALF as text
    % str2double(get(hObject,'String')) returns contents of ALF as a double
    
    handles.ALF=str2double(get(hObject,'string'));
    if isnan(handles.ALF)
        errordlg('you must enter a numeric value','Error')
    end
    guidata(hObject,handles)

% --- Executes during object creation, after setting all properties.
function ALF_CreateFcn(hObject, eventdata, handles)
    % hObject    handle to ALF (see GCBO)
    % eventdata  reserved - to be defined in a future version of MATLAB
    % handles    empty - handles not created until after all CreateFcns called
    
    % Hint: edit controls usually have a white background on Windows.
    % See ISPC and COMPUTER.
    if ispc && isequal(get(hObject,'BackgroundColor'),
        get(0,'defaultUicontrolBackgroundColor'))
        set(hObject,'BackgroundColor','white');
    end

% --- Executes on button press in pushbutton2.
function pushbutton2_Callback(hObject, eventdata, handles)
    % hObject    handle to pushbutton2 (see GCBO)
    % eventdata  reserved - to be defined in a future version of MATLAB
    % handles    structure with handles and user data (see GUIDATA)
    
    % To calculate the Dc times constant of the applicable fault loop
    T1=((handles.Xr)/(2*pi*(handles.f)));
    set(handles.T1,'string',T1);

    % To calculate the Source impedance
    Zs=handles.Vs*1000/(sqrt(3)*handles.If*1000);
    set(handles.Zs,'string',Zs);

    % To calculate the Real part of Source impedance
    Rs=(1.1)*(Zs)*(cos((83.08*pi)/180));
    set(handles.Rs,'string',Rs);

    % To calculate the imag part of Source impedance
    Xs=(1.1)*(Zs)*(sin((83.08*pi)/180));
    set(handles.Xs,'string',Xs);

    % To Calculate the Actual Source impedance
% To Calculate the real part of Line Impedance
Rl=(0.2887)*(0.8)*(handles.L)*\(\cos((83.08*\pi)/180))
set(handles.Rl,'string',Rl);

% To Calculate the imag part of Line Impedance
Xl=(0.2887)*(0.8)*(handles.L)*\(\sin((83.08*\pi)/180))
set(handles.Xl,'string',Xl);

% To calculate the Actual Line Impedance
Zbl=sqrt(Rl^2+Xl^2);
set(handles.Zbl,'string',Zbl);

% To calculate the Lead resistance
RL=2*(handles.Ic)*(handles.Cr)
set(handles.RL,'string',RL);

% To calculate the overall Total impedance
ZT=sqrt(((Rs+Rl)^2)+((Xs+Xl)^2))
set(handles.ZT,'string',ZT);

% To calculate the transient overdimensioning factor
Ktf=0.75
set(handles.Ktf,'string',Ktf);

% To calculate the transient overdimensioning that consider remanence
Krem=1/((1-handles.Kr))
set(handles.Krem,'string',Krem);

% to calculate full load current in primary
Ip=(handles.MVA*1000000)/(handles.Vs*1000*sqrt(3));
set(handles.Ip,'string',Ip);

% --- Executes on button press in pushbutton3.
function pushbutton3_Callback(hObject, eventdata, handles)
% hObject handle to pushbutton3 (see GCBO)
% eventdata reserved - to be defined in a future version of MATLAB
% handles structure with handles and user data (see GUIDATA)

% --- Executes on button press in pushbutton4.
function pushbutton4_Callback(hObject, eventdata, handles)
% hObject handle to pushbutton4 (see GCBO)
% eventdata reserved - to be defined in a future version of MATLAB
% handles structure with handles and user data (see GUIDATA)

Ktf=0.75
Zs=handles.Vs*1000/(sqrt(3)*handles.If*1000);
If1=(1.1*(handles.Vs*1000/sqrt(3)))/Zs
ALF1=(If1/(handles.Ip1))*Ktf
set(handles.ALF1,'string',ALF1);

RL=2*(handles.Ic)*(handles.Cr)
Rct1=(handles.Ip1)*(handles.Ohm)
Rct2=(handles.Ip2)*(handles.Ohm)
Rb=RL+(handles.Rr)

% To calculate Actual Accuracy Limit factor
Pi=(handles.Ip3)*Rct1
Pn=handles.VA1
Pb=(handles.Ip3)* (RL+(handles.Rr))
ALF2=(ALF1)*((Pi+Pb)/(Pi+Pn))
set(handles.ALF2, 'string', ALF2);

% To calculate Actual knee point Voltage
Vknee1=(ALF2)*(handles.Ip3)*(Rct1+Rb)
set(handles.Vknee1, 'string', Vknee1);

% To calculate Actual Burden
VA2=(Vknee1/ALF2)-Rct1
set(handles.VA2, 'string', VA2);

ALF3=(If1/(handles.Ip2))*Ktf
set(handles.ALF3, 'string', ALF3);

% To calculate Actual Accuracy Limit factor
Pj=(handles.Ip3)*Rct2
Pn=handles.VA1
Pb=(handles.Ip3)* (RL+(handles.Rr))
ALF4=(ALF3)*((Pj+Pb)/(Pj+Pn));
set(handles.ALF4, 'string', ALF4);

% To calculate 2nd ratio Actual knee point Voltage
Vknee3=(ALF4)*(handles.Ip3)*(Rct2+Rb);
set(handles.Vknee3, 'string', Vknee3);
% To calculate 2nd ration Actual Burden
VA4=(Vknee3/ALF4)-Rct2;
set(handles.VA4, 'string', VA4);

%Compare the Accuracy Lim
i=1;
if ALF2<=handles.ALF20 && Vknee1<=handles.Vknee20 && VA2<=handles.VA20
  e{i}=sprintf('CT is Adequate\n');
else
  e{i}=sprintf('CT is not Adequate\n');
end
handles.list=[e];
set(handles.status, 'string', handles.list);
guidata(hObject, handles);

% --- Executes on button press in pushbutton5.
function pushbutton5_Callback(hObject, eventdata, handles)
  % hObject    handle to pushbutton5 (see GCBO)
  % eventdata  reserved - to be defined in a future version of MATLAB
  % handles    structure with handles and user data (see GUIDATA)

% --- Executes on button press in Zs.
function Zs_Callback(hObject, eventdata, handles)
  % hObject    handle to Zs (see GCBO)
  % eventdata  reserved - to be defined in a future version of MATLAB
  % handles    structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of Zs
% --- Executes on button press in pushbutton6.
function pushbutton6_Callback(hObject, eventdata, handles)
% hObject    handle to pushbutton6 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)
%
% --- Executes on button press in Zbs.
function Zbs_Callback(hObject, eventdata, handles)
% hObject    handle to Zbs (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)
% Hint: get(hObject,'Value') returns toggle state of Zbs

% --- Executes on button press in pushbutton7.
function pushbutton7_Callback(hObject, eventdata, handles)
% hObject    handle to pushbutton7 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)
%
% --- Executes on button press in Rs.
function Rs_Callback(hObject, eventdata, handles)
% hObject    handle to Rs (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)
% Hint: get(hObject,'Value') returns toggle state of Rs

% --- Executes on button press in pushbutton8.
function pushbutton8_Callback(hObject, eventdata, handles)
% hObject    handle to pushbutton8 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)
%
% --- Executes on button press in Xs.
function Xs_Callback(hObject, eventdata, handles)
% hObject    handle to Xs (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)
% Hint: get(hObject,'Value') returns toggle state of Xs

% --- Executes on button press in pushbutton9.
function pushbutton9_Callback(hObject, eventdata, handles)
% hObject    handle to pushbutton9 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)
%
% --- Executes on button press in togglebutton5.
function togglebutton5_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton5 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)
% Hint: get(hObject,'Value') returns toggle state of togglebutton5
% --- Executes on button press in pushbutton10.
function pushbutton10_Callback(hObject, eventdata, handles)
% hObject    handle to pushbutton10 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% --- Executes on button press in Zbl.
function Zbl_Callback(hObject, eventdata, handles)
% hObject    handle to Zbl (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of Zbl

% --- Executes on button press in pushbutton11.
function pushbutton11_Callback(hObject, eventdata, handles)
% hObject    handle to pushbutton11 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% --- Executes on button press in togglebutton7.
function togglebutton7_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton7 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of togglebutton7

% --- Executes on button press in pushbutton12.
function pushbutton12_Callback(hObject, eventdata, handles)
% hObject    handle to pushbutton12 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% --- Executes on button press in T1.
function T1_Callback(hObject, eventdata, handles)
% hObject    handle to T1 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of T1

% --- Executes on button press in Rl.
function Rl_Callback(hObject, eventdata, handles)
% hObject    handle to Rl (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of Rl

% --- Executes on button press in Xl.
function Xl_Callback(hObject, eventdata, handles)
% hObject    handle to Xl (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of Xl

% --- Executes on button press in pushbutton13.
function pushbutton13_Callback(hObject, eventdata, handles)
% hObject    handle to pushbutton13 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% --- Executes on button press in togglebutton9.
function togglebutton9_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton9 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of togglebutton9

% --- Executes on button press in pushbutton14.
function pushbutton14_Callback(hObject, eventdata, handles)
% hObject    handle to pushbutton14 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% --- Executes on button press in ZT.
function ZT_Callback(hObject, eventdata, handles)
% hObject    handle to ZT (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of ZT

% --- Executes on button press in pushbutton15.
function pushbutton15_Callback(hObject, eventdata, handles)
% hObject    handle to pushbutton15 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% --- Executes on button press in Ktf.
function Ktf_Callback(hObject, eventdata, handles)
% hObject    handle to Ktf (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of Ktf

% --- Executes on button press in pushbutton16.
function pushbutton16_Callback(hObject, eventdata, handles)
% hObject    handle to pushbutton16 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% --- Executes on button press in Krem.
function Krem_Callback(hObject, eventdata, handles)
% hObject    handle to Krem (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of Krem

% --- Executes on button press in pushbutton17.
function pushbutton17_Callback(hObject, eventdata, handles)
% hObject    handle to pushbutton17 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)
% handles structure with handles and user data (see GUIDATA)

% --- Executes on button press in RL.
function RL_Callback(hObject, eventdata, handles)
% hObject handle to RL (see GCBO)
% eventdata reserved - to be defined in a future version of MATLAB
% handles structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of RL

% --- Executes on button press in Ip.
function Ip_Callback(hObject, eventdata, handles)
% hObject handle to Ip (see GCBO)
% eventdata reserved - to be defined in a future version of MATLAB
% handles structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of Ip
% --- Executes on button press in togglebutton13.
function togglebutton13_Callback(hObject, eventdata, handles)
% hObject handle to togglebutton13 (see GCBO)
% eventdata reserved - to be defined in a future version of MATLAB
% handles structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of togglebutton13
% --- Executes on button press in togglebutton14.
function togglebutton14_Callback(hObject, eventdata, handles)
% hObject handle to togglebutton14 (see GCBO)
% eventdata reserved - to be defined in a future version of MATLAB
% handles structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of togglebutton14

% --- Executes on button press in togglebutton15.
function togglebutton15_Callback(hObject, eventdata, handles)
% hObject handle to togglebutton15 (see GCBO)
% eventdata reserved - to be defined in a future version of MATLAB
% handles structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of togglebutton15

% --- Executes on button press in togglebutton17.
function togglebutton17_Callback(hObject, eventdata, handles)
% hObject handle to togglebutton17 (see GCBO)
% eventdata reserved - to be defined in a future version of MATLAB
% handles structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of togglebutton17

% --- Executes on button press in togglebutton18.
function togglebutton18_Callback(hObject, eventdata, handles)
% hObject handle to togglebutton18 (see GCBO)
% eventdata reserved - to be defined in a future version of MATLAB
% handles structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of togglebutton18
Executes on button press in Iefc1.

```matlab
function Iefc1_Callback(hObject, eventdata, handles)
    % hObject    handle to Iefc1 (see GCBO)
    % eventdata  reserved - to be defined in a future version of MATLAB
    % handles    structure with handles and user data (see GUIDATA)

    % Hint: get(hObject,'Value') returns toggle state of Iefc1
```

Executes on button press in Iefc2.

```matlab
function Iefc2_Callback(hObject, eventdata, handles)
    % hObject    handle to Iefc2 (see GCBO)
    % eventdata  reserved - to be defined in a future version of MATLAB
    % handles    structure with handles and user data (see GUIDATA)

    % Hint: get(hObject,'Value') returns toggle state of Iefc2
```

Executes on button press in Calculate.

```matlab
function Calculate_Callback(hObject, eventdata, handles)
    % hObject    handle to Calculate (see GCBO)
    % eventdata  reserved - to be defined in a future version of MATLAB
    % handles    structure with handles and user data (see GUIDATA)
```

Executes on button press in C2.

```matlab
function C2_Callback(hObject, eventdata, handles)
    % hObject    handle to C2 (see GCBO)
    % eventdata  reserved - to be defined in a future version of MATLAB
    % handles    structure with handles and user data (see GUIDATA)
    core2;
```

Executes on button press in Total.

```matlab
function Total_Callback(hObject, eventdata, handles)
    % hObject    handle to Total (see GCBO)
    % eventdata  reserved - to be defined in a future version of MATLAB
    % handles    structure with handles and user data (see GUIDATA)

    % Hint: get(hObject,'Value') returns toggle state of Total
```

```matlab
function MVA_Callback(hObject, eventdata, handles)
    % hObject    handle to MVA (see GCBO)
    % eventdata  reserved - to be defined in a future version of MATLAB
    % handles    structure with handles and user data (see GUIDATA)

    % Hints: get(hObject,'String') returns contents of MVA as text
    %        str2double(get(hObject,'String')) returns contents of MVA as a double
    handles.MVA=str2double(get(hObject,'string'));
    if isnan(handles.MVA)
        errordlg('you must enter a numeric value','Error')
    end
    guidata(hObject,handles)
```

Executes on button press in Io.

```matlab
function edit31_Callback(hObject, eventdata, handles)
    % hObject    handle to Io (see GCBO)
    % eventdata  reserved - to be defined in a future version of MATLAB
    % handles    structure with handles and user data (see GUIDATA)

    % Hints: get(hObject,'String') returns contents of Io as text
```
str2double(get(hObject,'String')) returns contents of Io as a double

--- Executes during object creation, after setting all properties.
function edit31_CreateFcn(hObject, eventdata, handles)
% hObject    handle to Io (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    empty - handles not created until after all CreateFcns called

% Hint: edit controls usually have a white background on Windows.
% See ISPC and COMPUTER.
if ispc && isequal(get(hObject,'BackgroundColor'),
    get(0,'defaultUicontrolBackgroundColor'))
    set(hObject,'BackgroundColor','white');
end

--- Executes on button press in pushbutton18.
function pushbutton18_Callback(hObject, eventdata, handles)
% hObject    handle to pushbutton18 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

--- Executes during object creation, after setting all properties.
function MVA_CreateFcn(hObject, eventdata, handles)
% hObject    handle to MVA (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    empty - handles not created until after all CreateFcns called

% Hint: edit controls usually have a white background on Windows.
% See ISPC and COMPUTER.
if ispc && isequal(get(hObject,'BackgroundColor'),
    get(0,'defaultUicontrolBackgroundColor'))
    set(hObject,'BackgroundColor','white');
end

--- Executes on button press in pushbutton19.
function pushbutton19_Callback(hObject, eventdata, handles)
% hObject    handle to pushbutton19 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

--- Executes on button press in togglebutton21.
function togglebutton21_Callback(hObject, eventdata, handles)
% hObject    handle to Togglebutton21 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of togglebutton21

--- Executes on button press in togglebutton22.
function togglebutton22_Callback(hObject, eventdata, handles)
% hObject    handle to Togglebutton22 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)
% Hint: get(hObject,'Value') returns toggle state of togglebutton22

% --- Executes on button press in togglebutton23.
function togglebutton23_Callback(hObject, eventdata, handles)
% hObject handle to togglebutton23 (see GCBO)
% eventdata reserved - to be defined in a future version of MATLAB
% handles structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of togglebutton23

% --- Executes on button press in togglebutton24.
function togglebutton24_Callback(hObject, eventdata, handles)
% hObject handle to togglebutton24 (see GCBO)
% eventdata reserved - to be defined in a future version of MATLAB
% handles structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of togglebutton24

% --- Executes on button press in togglebutton25.
function togglebutton25_Callback(hObject, eventdata, handles)
% hObject handle to togglebutton25 (see GCBO)
% eventdata reserved - to be defined in a future version of MATLAB
% handles structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of togglebutton25

% --- Executes on button press in togglebutton26.
function togglebutton26_Callback(hObject, eventdata, handles)
% hObject handle to togglebutton26 (see GCBO)
% eventdata reserved - to be defined in a future version of MATLAB
% handles structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of togglebutton26

% --- Executes on button press in togglebutton27.
function togglebutton27_Callback(hObject, eventdata, handles)
% hObject handle to togglebutton27 (see GCBO)
% eventdata reserved - to be defined in a future version of MATLAB
% handles structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of togglebutton27

% --- Executes on button press in pushbutton20.
function pushbutton20_Callback(hObject, eventdata, handles)
% hObject handle to pushbutton20 (see GCBO)
% eventdata reserved - to be defined in a future version of MATLAB
% handles structure with handles and user data (see GUIDATA)

% --- Executes on button press in togglebutton28.
function togglebutton28_Callback(hObject, eventdata, handles)
% hObject handle to togglebutton28 (see GCBO)
% eventdata reserved - to be defined in a future version of MATLAB
% handles structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of togglebutton28

% --- Executes on button press in togglebutton29.
function togglebutton29_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton29 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of togglebutton29

function togglebutton30_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton30 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of togglebutton30

function togglebutton31_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton31 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of togglebutton31

function togglebutton32_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton32 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of togglebutton32

function togglebutton33_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton33 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of togglebutton33

function togglebutton34_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton34 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of togglebutton34

function togglebutton35_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton35 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of togglebutton35
% --- Executes on button press in togglebutton36.
function togglebutton36_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton36 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)
% Hint: get(hObject,'Value') returns toggle state of togglebutton36

% --- Executes on button press in togglebutton37.
function togglebutton37_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton37 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)
% Hint: get(hObject,'Value') returns toggle state of togglebutton37

% --- Executes on button press in togglebutton38.
function togglebutton38_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton38 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)
% Hint: get(hObject,'Value') returns toggle state of togglebutton38

% --- Executes on button press in togglebutton39.
function togglebutton39_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton39 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)
% Hint: get(hObject,'Value') returns toggle state of togglebutton39

% --- Executes on button press in togglebutton40.
function togglebutton40_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton40 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)
% Hint: get(hObject,'Value') returns toggle state of togglebutton40

% --- Executes on button press in togglebutton41.
function togglebutton41_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton41 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)
% Hint: get(hObject,'Value') returns toggle state of togglebutton41

% --- Executes on button press in togglebutton42.
function togglebutton42_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton42 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)
% Hint: get(hObject,'Value') returns toggle state of togglebutton42

% --- Executes on button press in togglebutton43.
function togglebutton43_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton43 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)
function status_Callback(hObject, eventdata, handles)
   hObject    handle to status (see GCBO)
   eventdata  reserved - to be defined in a future version of MATLAB
   handles    structure with handles and user data (see GUIDATA)

   % Hints: get(hObject,'Value') returns toggle state of togglebutton43
   % get(hObject,'String') returns contents of status as text
   % str2double(get(hObject,'String')) returns contents of status as a double

   % --- Executes during object creation, after setting all properties.
   function status_CreateFcn(hObject, eventdata, handles)
      hObject    handle to status (see GCBO)
      eventdata  reserved - to be defined in a future version of MATLAB
      handles    empty - handles not created until after all CreateFcns called

      % Hint: edit controls usually have a white background on Windows.
      % See ISPC and COMPUTER.
      if ispc && isequal(get(hObject,'BackgroundColor'),
         get(0,'defaultUicontrolBackgroundColor'))
         set(hObject,'BackgroundColor','white');
      end

function ALF20_Callback(hObject, eventdata, handles)
   hObject    handle to ALF20 (see GCBO)
   eventdata  reserved - to be defined in a future version of MATLAB
   handles    structure with handles and user data (see GUIDATA)

   % Hints: get(hObject,'String') returns contents of ALF20 as text
   % str2double(get(hObject,'String')) returns contents of ALF20 as a double

   handles.ALF20=str2double(get(hObject,'string'));
   if isnan(handles.ALF20)
      errordlg('you must enter a numeric value','Error')
   end
guidata(hObject,handles)

   % --- Executes during object creation, after setting all properties.
   function ALF20_CreateFcn(hObject, eventdata, handles)
      hObject    handle to ALF20 (see GCBO)
      eventdata  reserved - to be defined in a future version of MATLAB
      handles    empty - handles not created until after all CreateFcns called

      % Hint: edit controls usually have a white background on Windows.
      % See ISPC and COMPUTER.
      if ispc && isequal(get(hObject,'BackgroundColor'),
         get(0,'defaultUicontrolBackgroundColor'))
         set(hObject,'BackgroundColor','white');
      end

function Vknee20_Callback(hObject, eventdata, handles)
   hObject    handle to Vknee20 (see GCBO)
% eventdata reserved - to be defined in a future version of MATLAB
% handles structure with handles and user data (see GUIDATA)
% Hints: get(hObject,'String') returns contents of Vknee20 as text
% str2double(get(hObject,'String')) returns contents of Vknee20 as a double

handles.Vknee20=str2double(get(hObject,'string'));
if isnan(handles.Vknee20)
    errordlg('you must enter a numeric value','Error')
end

guidata(hObject,handles)

% --- Executes during object creation, after setting all properties.
function Vknee20_CreateFcn(hObject, eventdata, handles)
% hObject    handle to Vknee20 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    empty - handles not created until after all CreateFcns called

% Hint: edit controls usually have a white background on Windows.
%       See ISPC and COMPUTER.
if ispc && isequal(get(hObject,'BackgroundColor'),
    get(0,'defaultUicontrolBackgroundColor'))
    set(hObject,'BackgroundColor','white');
end

function VA20_Callback(hObject, eventdata, handles)
% hObject    handle to VA20 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hints: get(hObject,'String') returns contents of VA20 as text
% str2double(get(hObject,'String')) returns contents of VA20 as a double

handles.VA20=str2double(get(hObject,'string'));
if isnan(handles.VA20)
    errordlg('you must enter a numeric value','Error')
end

guidata(hObject,handles)

% --- Executes during object creation, after setting all properties.
function VA20_CreateFcn(hObject, eventdata, handles)
% hObject    handle to VA20 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    empty - handles not created until after all CreateFcns called

% Hint: edit controls usually have a white background on Windows.
%       See ISPC and COMPUTER.
if ispc && isequal(get(hObject,'BackgroundColor'),
    get(0,'defaultUicontrolBackgroundColor'))
    set(hObject,'BackgroundColor','white');
end

% --- Executes on button press in pushbutton24.
function pushbutton24_Callback(hObject, eventdata, handles)
% hObject    handle to pushbutton24 (see GCBO)
% eventdata reserved - to be defined in a future version of MATLAB
% handles  structure with handles and user data (see GUIDATA)
core2;

% --- Executes on button press in togglebutton44.
function togglebutton44_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton44 (see GCBO)
% eventdata reserved - to be defined in a future version of MATLAB
% handles  structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of togglebutton44

% --- Executes on button press in togglebutton45.
function togglebutton45_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton45 (see GCBO)
% eventdata reserved - to be defined in a future version of MATLAB
% handles  structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of togglebutton45

% --- Executes on button press in togglebutton46.
function togglebutton46_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton46 (see GCBO)
% eventdata reserved - to be defined in a future version of MATLAB
% handles  structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of togglebutton46

% --- Executes on button press in togglebutton47.
function togglebutton47_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton47 (see GCBO)
% eventdata reserved - to be defined in a future version of MATLAB
% handles  structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of togglebutton47

% --- Executes on button press in togglebutton48.
function togglebutton48_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton48 (see GCBO)
% eventdata reserved - to be defined in a future version of MATLAB
% handles  structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of togglebutton48

% --- Executes on button press in togglebutton49.
function togglebutton49_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton49 (see GCBO)
% eventdata reserved - to be defined in a future version of MATLAB
% handles  structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of togglebutton49

% --- Executes on button press in togglebutton50.
function togglebutton50_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton50 (see GCBO)
% eventdata reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of togglebutton50
% --- Executes on button press in togglebutton51.
function togglebutton51_Callback(hObject, eventdata, handles)
    % hObject    handle to togglebutton51 (see GCBO)
    % eventdata  reserved - to be defined in a future version of MATLAB
    % handles    structure with handles and user data (see GUIDATA)
    % Hint: get(hObject,'Value') returns toggle state of togglebutton51

% --- Executes on button press in togglebutton52.
function togglebutton52_Callback(hObject, eventdata, handles)
    % hObject    handle to togglebutton52 (see GCBO)
    % eventdata  reserved - to be defined in a future version of MATLAB
    % handles    structure with handles and user data (see GUIDATA)
    % Hint: get(hObject,'Value') returns toggle state of togglebutton52

% --- Executes on button press in togglebutton53.
function togglebutton53_Callback(hObject, eventdata, handles)
    % hObject    handle to togglebutton53 (see GCBO)
    % eventdata  reserved - to be defined in a future version of MATLAB
    % handles    structure with handles and user data (see GUIDATA)
    % Hint: get(hObject,'Value') returns toggle state of togglebutton53

% --- Executes on button press in togglebutton54.
function togglebutton54_Callback(hObject, eventdata, handles)
    % hObject    handle to togglebutton54 (see GCBO)
    % eventdata  reserved - to be defined in a future version of MATLAB
    % handles    structure with handles and user data (see GUIDATA)
    % Hint: get(hObject,'Value') returns toggle state of togglebutton54

% --- Executes on button press in togglebutton55.
function togglebutton55_Callback(hObject, eventdata, handles)
    % hObject    handle to togglebutton55 (see GCBO)
    % eventdata  reserved - to be defined in a future version of MATLAB
    % handles    structure with handles and user data (see GUIDATA)
    % Hint: get(hObject,'Value') returns toggle state of togglebutton55

% --- Executes on button press in togglebutton56.
function togglebutton56_Callback(hObject, eventdata, handles)
    % hObject    handle to togglebutton56 (see GCBO)
    % eventdata  reserved - to be defined in a future version of MATLAB
    % handles    structure with handles and user data (see GUIDATA)
    % Hint: get(hObject,'Value') returns toggle state of togglebutton56

% --- Executes on button press in togglebutton57.
function togglebutton57_Callback(hObject, eventdata, handles)
    % hObject    handle to togglebutton57 (see GCBO)
    % eventdata  reserved - to be defined in a future version of MATLAB
    % handles    structure with handles and user data (see GUIDATA)
% Hint: get(hObject,'Value') returns toggle state of togglebutton57
% --- Executes on button press in togglebutton58.
function togglebutton58_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of togglebutton58

% --- Executes on button press in togglebutton59.
function togglebutton59_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of togglebutton59

% --- Executes on button press in togglebutton60.
function togglebutton60_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of togglebutton60

% --- Executes on button press in togglebutton61.
function togglebutton61_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of togglebutton61

% --- Executes on button press in togglebutton62.
function togglebutton62_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of togglebutton62

% --- Executes on button press in togglebutton63.
function togglebutton63_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of togglebutton63

% --- Executes on button press in togglebutton64.
function togglebutton64_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)
% Hint: get(hObject,'Value') returns toggle state of togglebutton64

% --- Executes on button press in togglebutton65.
function togglebutton65_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton65 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of togglebutton65

% --- Executes on button press in togglebutton66.
function togglebutton66_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton66 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of togglebutton66

% --- Executes on button press in togglebutton67.
function togglebutton67_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton67 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of togglebutton67

% --- Executes on button press in togglebutton68.
function togglebutton68_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton68 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of togglebutton68

% --- Executes on button press in togglebutton69.
function togglebutton69_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton69 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of togglebutton69

% --- Executes on button press in togglebutton70.
function togglebutton70_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton70 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of togglebutton70

% --- Executes on button press in togglebutton71.
function togglebutton71_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton71 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of togglebutton71
% --- Executes on button press in pushbutton25.
function pushbutton25_Callback(hObject, eventdata, handles)
% hObject    handle to pushbutton25 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

x1=[0.0010 0.0020 0.0040 0.0050 0.0080 0.0100 0.0200 0.0400 0.0500 0.0800 0.1000 0.2000 0.4000 0.5000 0.8000 1.0000 0.169 0.325 0.630 1.000]
y1=[2.2 4.5 13.9 19.4 35.7 41.6 512.2 538.5 586.8 613.2 620.1 634.8 641.8 653.5 674.2 695.9]
y2=[2.1 5.4 15.8 20.8 39.5 42.3 515.9 540.3 580.9 604.4 611.3 625.1 631.8 649.2 655.1 660.8]
y3=[3.2 5.8 18.6 23.9 47.7 65.9 183.4 412.8 463.8 521.1 537.2 571.8 594.4 600.8 614.4 621.5]

figure
axes('FontSize',13)
loglog(x1,y1,'-ro','LineWidth',1.0,'MarkerEdgeColor','r','MarkerFaceColor','g','MarkerSize',2)
hold on
loglog(x1,y2,'-yo','LineWidth',1.0,'MarkerEdgeColor','r','MarkerFaceColor','r','MarkerSize',2)
hold on
loglog(x1,y3,'-bo','LineWidth',1.0,'MarkerEdgeColor','r','MarkerFaceColor','w','MarkerSize',2)
hold off
h = legend('Red Phase','Yellow Phase','Blue Phase',10);
grid on
xlabel({'Current in mA';'Current'})
ylabel({'Voltage in V';'Voltage'})
title('CT SATURATION PLOT','fontsize',15,'fontweight','b');
text(0.0580,350.1,'(0.0712,496.4)','FontSize',10,'fontweight','b')
text(0.0580,400.1,'(0.0678,491.7)','FontSize',10,'fontweight','b')
text(0.0580,450.1,'(0.0504,465.4)','FontSize',10,'fontweight','b')
text(0.01,14,'ASA 10/50
Vkp:CT R = 496.4 V; CT Y = 491.7V; CT B = 465.4V','FontSize',12,'fontweight','b')
text(0.01,11,'Vkp = 248.2
V;245.85V;232.7V','FontSize',12,'fontweight','b')
APPENDIX E– CORE 3–BACK UP DISTANCE PROTECTION (Core.m)

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CODES FOR CORE 3 – BACKUP DISTANCE PROTECTION
PROGRAM DISIGNED BY :
AHMAD NAJMI ABDULLAH (KGDO70005)

-----------------------------------------------------------------------------------

function varargout = core2(varargin)
% CORE2 M-file for core2.fig
%   CORE2, by itself, creates a new CORE2 or raises the existing
%   singleton*.
%   H = CORE2 returns the handle to a new CORE2 or the handle to
%   the existing singleton*.
%   CORE2('CALLBACK',hObject,eventData,handles,...) calls the local
%   function named CALLBACK in CORE2.M with the given input
%   arguments.
%   CORE2('Property','Value',...) creates a new CORE2 or raises the
%   existing singleton*. Starting from the left, property value
%   pairs are
%   applied to the GUI before core2_OpeningFunction gets called. An
%   unrecognized property name or invalid value makes property
%   application
%   stop. All inputs are passed to core2_OpeningFcn via varargin.
%   *See GUI Options on GUIDE's Tools menu. Choose "GUI allows only
%   one
%   instance to run (singleton)".
% See also: GUIDE, GUIDATA, GUIHANDLES
% Edit the above text to modify the response to help core2
% Last Modified by GUIDE v2.5 12-Nov-2009 15:32:31
% Begin initialization code - DO NOT EDIT
gui_Singleton = 1;
gui_State = struct('gui_Name', mfilename,...
   'gui_Singleton', gui_Singleton,...
   'gui_OpeningFcn', @core2_OpeningFcn,...
   'gui_OutputFcn', @core2_OutputFcn,...
   'gui_LayoutFcn', [], ...
   'gui_Callback', []);
if nargin && ischar(varargin{1})
   gui_State.gui_Callback = str2func(varargin{1});
end

if nargout
   [varargout{1:nargout}] = gui_mainfcn(gui_State, varargin{:});
else
   gui_mainfcn(gui_State, varargin{:});
end
% End initialization code - DO NOT EDIT

% --- Executes just before core2 is made visible.
function core2_OpeningFcn(hObject, eventdata, handles, varargin)
backgroundImage = importdata('p441.jpg');
axes(handles.blockdiagram2_pic);
image(backgroundImage);
axis off
% Choose default command line output for core2
handles.output = hObject;

% Update handles structure
guidata(hObject, handles);

% UIWAIT makes core2 wait for user response (see UIRESUME)
% uwait(handles.figure1);

% --- Outputs from this function are returned to the command line.
function varargout = core2_OutputFcn(hObject, eventdata, handles)
% varargout  cell array for returning output args (see VARARGOUT);
% hObject    handle to figure
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Get default command line output from handles structure
varargout{1} = handles.output;

% --- Executes during object creation, after setting all properties.
function edit1_CreateFcn(hObject, eventdata, handles)
% hObject    handle to edit1 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    empty - handles not created until after all CreateFcns called

% Hint: edit controls usually have a white background on Windows.
%       See ISPC and COMPUTER.
if ispc && isequal(get(hObject,'BackgroundColor'),
    get(0,'defaultUicontrolBackgroundColor'))
    set(hObject,'BackgroundColor','white');
end

% Hints: get(hObject,'String') returns contents of edit1 as text
%        str2double(get(hObject,'String')) returns contents of edit1 as a double

function edit1_Callback(hObject, eventdata, handles)
% hObject    handle to edit1 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% --- Executes during object creation, after setting all properties.
function Ip1_CreateFcn(hObject, eventdata, handles)
% hObject    handle to Ip1 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    empty - handles not created until after all CreateFcns called

% Hint: edit controls usually have a white background on Windows.
%       See ISPC and COMPUTER.
if ispc && isequal(get(hObject,'BackgroundColor'),
    get(0,'defaultUicontrolBackgroundColor'))
    set(hObject,'BackgroundColor','white');
end

function Ip1_Callback(hObject, eventdata, handles)
% hObject    handle to Ip1 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)
% Hints: get(hObject,'String') returns contents of Ip1 as text
%        str2double(get(hObject,'String')) returns contents of Ip1 as a
double

handles.Ip1=str2double(get(hObject,'string'));
if isnan(handles.Ip1)
    errordlg('you must enter a numeric value','Error')
end
guidata(hObject,handles)

% --- Executes during object creation, after setting all properties.
function Ip1_CreateFcn(hObject, eventdata, handles)
% hObject    handle to Ip1 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    empty - handles not created until after all CreateFcns
called

% Hint: edit controls usually have a white background on Windows.
%       See ISPC and COMPUTER.
if ispc && isequal(get(hObject,'BackgroundColor'),
    get(0,'defaultUicontrolBackgroundColor'))
    set(hObject,'BackgroundColor','white');
end

function Ip2_Callback(hObject, eventdata, handles)
% hObject    handle to Ip2 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hints: get(hObject,'String') returns contents of Ip2 as text
%        str2double(get(hObject,'String')) returns contents of Ip2 as a
double

handles.Ip2=str2double(get(hObject,'string'));
if isnan(handles.Ip2)
    errordlg('you must enter a numeric value','Error')
end
guidata(hObject,handles)

% --- Executes during object creation, after setting all properties.
function Ip2_CreateFcn(hObject, eventdata, handles)
% hObject    handle to Ip2 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    empty - handles not created until after all CreateFcns
called

% Hint: edit controls usually have a white background on Windows.
%       See ISPC and COMPUTER.
if ispc && isequal(get(hObject,'BackgroundColor'),
    get(0,'defaultUicontrolBackgroundColor'))
    set(hObject,'BackgroundColor','white');
end

function Ip3_Callback(hObject, eventdata, handles)
% hObject    handle to Ip3 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)
% Hints: get(hObject,'String') returns contents of Ip3 as text
%        str2double(get(hObject,'String')) returns contents of Ip3 as a double

handles.Ip3=str2double(get(hObject,'string'));
if isnan(handles.Ip3)
    errordlg('you must enter a numeric value','Error')
end
guidata(hObject,handles)

% --- Executes during object creation, after setting all properties.
function Ip3_CreateFcn(hObject, eventdata, handles)
% hObject    handle to Ip3 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    empty - handles not created until after all CreateFcns called

% Hint: edit controls usually have a white background on Windows.
%       See ISPC and COMPUTER.
if ispc && isequal(get(hObject,'BackgroundColor'),
    get(0,'defaultUicontrolBackgroundColor'))
    set(hObject,'BackgroundColor','white');
end

function Io_Callback(hObject, eventdata, handles)
% hObject    handle to Io (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hints: get(hObject,'String') returns contents of Io as text
%        str2double(get(hObject,'String')) returns contents of Io as a double

% --- Executes during object creation, after setting all properties.
function Io_CreateFcn(hObject, eventdata, handles)
% hObject    handle to Io (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    empty - handles not created until after all CreateFcns called

% Hint: edit controls usually have a white background on Windows.
%       See ISPC and COMPUTER.
if ispc && isequal(get(hObject,'BackgroundColor'),
    get(0,'defaultUicontrolBackgroundColor'))
    set(hObject,'BackgroundColor','white');
end

function Rr_Callback(hObject, eventdata, handles)
% hObject    handle to Rr (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hints: get(hObject,'String') returns contents of Rr as text
%        str2double(get(hObject,'String')) returns contents of Rr as a double
handles.Rr=str2double(get(hObject,'string'));
if isnan(handles.Rr)
    errordlg('you must enter a numeric value','Error')
end
guidata(hObject,handles)

% --- Executes during object creation, after setting all properties.
function Rr_CreateFcn(hObject, eventdata, handles)
% hObject    handle to Rr (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    empty - handles not created until after all CreateFcns called

% Hint: edit controls usually have a white background on Windows.  
%       See ISPC and COMPUTER.
if ispc && isequal(get(hObject,'BackgroundColor'),
    get(0,'defaultUicontrolBackgroundColor'))
    set(hObject,'BackgroundColor','white');
end

function VA1_Callback(hObject, eventdata, handles)
% hObject    handle to VA1 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hints: get(hObject,'String') returns contents of VA1 as text
% str2double(get(hObject,'String')) returns contents of VA1 as a double
handles.VA1=str2double(get(hObject,'string'));
if isnan(handles.VA1)
    errordlg('you must enter a numeric value','Error')
end
guidata(hObject,handles)

% --- Executes during object creation, after setting all properties.
function VA1_CreateFcn(hObject, eventdata, handles)
% hObject    handle to VA1 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    empty - handles not created until after all CreateFcns called

% Hint: edit controls usually have a white background on Windows.  
%       See ISPC and COMPUTER.
if ispc && isequal(get(hObject,'BackgroundColor'),
    get(0,'defaultUicontrolBackgroundColor'))
    set(hObject,'BackgroundColor','white');
end

% --- Executes on button press in pushbutton1.
function pushbutton1_Callback(hObject, eventdata, handles)
% hObject    handle to pushbutton1 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% To calculate highest CT Secondary resistance
Rct1=(handles.Ip1)*(handles.Ohm);
set(handles.Rct1,'string',Rct1);

% to calculate the Ext.Fault Current for 1st ratio
If1=(handles.If*1000)/(handles.Ip1);
set(handles.If1,'string',If1);

% To calculate the Actual Connected resistance
RL=2*(handles.Ic)*(handles.Cr);
Rb=RL+(handles.Rr);
set(handles.Rb,'string',Rb);

% To calculate Knee point Voltage
Vknee=((handles.VA1*handles.ALF)/handles.Ip3)+(handles.ALF*handles.Ip3*Rct1);
set(handles.Vknee,'string',Vknee);

% To calculate Acccurate Burden
VA=(Vknee/handles.ALF)-Rct1;
set(handles.VA,'string',VA);

function Vs_Callback(hObject, eventdata, handles)
% hObject    handle to Vs (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hints: get(hObject,'String') returns contents of Vs as text
%        str2double(get(hObject,'String')) returns contents of Vs as a double
handles.Vs=str2double(get(hObject,'string'));
if isnan(handles.Vs)
    errordlg('you must enter a numeric value','Error')
end
guidata(hObject,handles)

% --- Executes during object creation, after setting all properties.
function Vs_CreateFcn(hObject, eventdata, handles)
% hObject    handle to Vs (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    empty - handles not created until after all CreateFcns
called

% Hint: edit controls usually have a white background on Windows.
% See ISPC and COMPUTER.
if ispc && isequal(get(hObject,'BackgroundColor'),
    get(0,'defaultUicontrolBackgroundColor'))
    set(hObject,'BackgroundColor','white');
end

function If_Callback(hObject, eventdata, handles)
% hObject    handle to If (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hints: get(hObject,'String') returns contents of If as text
%        str2double(get(hObject,'String')) returns contents of If as a double
handles.If=str2double(get(hObject,'string')); if isnan(handles.If)    errordlg('you must enter a numeric value','Error') end.guidata(hObject,handles)

% --- Executes during object creation, after setting all properties. function If_CreateFcn(hObject, eventdata, handles) % hObject    handle to If (see GCBO) % eventdata  reserved - to be defined in a future version of MATLAB % handles    empty - handles not created until after all CreateFcns called

% Hint: edit controls usually have a white background on Windows. %       See ISPC and COMPUTER. if ispc && isequal(get(hObject,'BackgroundColor'), get(0,'defaultUicontrolBackgroundColor'))    set(hObject,'BackgroundColor','white'); end

function f_Callback(hObject, eventdata, handles) % hObject    handle to f (see GCBO) % eventdata  reserved - to be defined in a future version of MATLAB % handles    structure with handles and user data (see GUIDATA)

% Hints: get(hObject,'String') returns contents of f as text %        str2double(get(hObject,'String')) returns contents of f as a double

handles.f=str2double(get(hObject,'string')); if isnan(handles.f)    errordlg('you must enter a numeric value','Error') end.guidata(hObject,handles)

% --- Executes during object creation, after setting all properties. function f_CreateFcn(hObject, eventdata, handles) % hObject    handle to f (see GCBO) % eventdata  reserved - to be defined in a future version of MATLAB % handles    empty - handles not created until after all CreateFcns called

% Hint: edit controls usually have a white background on Windows. %       See ISPC and COMPUTER. if ispc && isequal(get(hObject,'BackgroundColor'), get(0,'defaultUicontrolBackgroundColor'))    set(hObject,'BackgroundColor','white'); end

function Ic_Callback(hObject, eventdata, handles) % hObject    handle to Ic (see GCBO) % eventdata  reserved - to be defined in a future version of MATLAB % handles    structure with handles and user data (see GUIDATA)

% Hints: get(hObject,'String') returns contents of Ic as text %        str2double(get(hObject,'String')) returns contents of Ic as a double
handles.Ic=str2double(get(hObject, 'string'));
if isnan(handles.Ic)
    errordlg('you must enter a numeric value', 'Error')
end
guidata(hObject,handles)

% --- Executes during object creation, after setting all properties.
function Ic_CreateFcn(hObject, eventdata, handles)
    % hObject    handle to Ic (see GCBO)
    % eventdata  reserved - to be defined in a future version of MATLAB
    % handles    empty - handles not created until after all CreateFcns called

    % Hint: edit controls usually have a white background on Windows.
    % See ISPC and COMPUTER.
    if ispc && isequal(get(hObject,'BackgroundColor'), get(0,'defaultUicontrolBackgroundColor'))
        set(hObject,'BackgroundColor','white');
    end

function Cc_Callback(hObject, eventdata, handles)
    % hObject    handle to Cc (see GCBO)
    % eventdata  reserved - to be defined in a future version of MATLAB
    % handles    structure with handles and user data (see GUIDATA)

    % Hints: get(hObject,'String') returns contents of Cc as text
    %        str2double(get(hObject,'String')) returns contents of Cc as a double

    handles.Cc=str2double(get(hObject,'string'));
    if isnan(handles.Cc)
        errordlg('you must enter a numeric value', 'Error')
    end
    guidata(hObject,handles)

% --- Executes during object creation, after setting all properties.
function Cc_CreateFcn(hObject, eventdata, handles)
    % hObject    handle to Cc (see GCBO)
    % eventdata  reserved - to be defined in a future version of MATLAB
    % handles    empty - handles not created until after all CreateFcns called

    % Hint: edit controls usually have a white background on Windows.
    % See ISPC and COMPUTER.
    if ispc && isequal(get(hObject,'BackgroundColor'), get(0,'defaultUicontrolBackgroundColor'))
        set(hObject,'BackgroundColor','white');
    end

function Cr_Callback(hObject, eventdata, handles)
    % hObject    handle to Cr (see GCBO)
    % eventdata  reserved - to be defined in a future version of MATLAB
    % handles    structure with handles and user data (see GUIDATA)

    % Hints: get(hObject,'String') returns contents of Cr as text
    %        str2double(get(hObject,'String')) returns contents of Cr as a double
handles.Cr=str2double(get(hObject,'string'));
if isnan(handles.Cr)
    errordlg('you must enter a numeric value','Error')
end
guidata(hObject,handles)

% --- Executes during object creation, after setting all properties.
function Cr_CreateFcn(hObject, eventdata, handles)
% hObject    handle to Cr (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    empty - handles not created until after all CreateFcns
% called

% Hint: edit controls usually have a white background on Windows.
% See ISPC and COMPUTER.
if ispc && isequal(get(hObject,'BackgroundColor'),
        get(0,'defaultUicontrolBackgroundColor'))
    set(hObject,'BackgroundColor','white');
end

function Xr_Callback(hObject, eventdata, handles)
% hObject    handle to Xr (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hints: get(hObject,'String') returns contents of Xr as text
%        str2double(get(hObject,'String')) returns contents of Xr as a
double

handles.Xr=str2double(get(hObject,'String'));
if isnan(handles.Xr)
    errordlg('you must enter a numeric value','Error')
end
guidata(hObject,handles)
% --- Executes during object creation, after setting all properties.
function Xr_CreateFcn(hObject, eventdata, handles)
% hObject    handle to Xr (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    empty - handles not created until after all CreateFcns
% called

% Hint: edit controls usually have a white background on Windows.
% See ISPC and COMPUTER.
if ispc && isequal(get(hObject,'BackgroundColor'),
        get(0,'defaultUicontrolBackgroundColor'))
    set(hObject,'BackgroundColor','white');
end

function L_Callback(hObject, eventdata, handles)
% hObject    handle to L (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hints: get(hObject,'String') returns contents of L as text
%        str2double(get(hObject,'String')) returns contents of L as a
double
handles.L = str2double(get(hObject, 'string'));
if isnan(handles.L)
    errordlg('you must enter a numeric value', 'Error')
end
guidata(hObject, handles)

% --- Executes during object creation, after setting all properties.
function L_CreateFcn(hObject, eventdata, handles)
% hObject    handle to L (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    empty - handles not created until after all CreateFcns called

% Hint: edit controls usually have a white background on Windows.
% See ISPC and COMPUTER.
if ispc && isequal(get(hObject, 'BackgroundColor'),
    get(0, 'defaultUicontrolBackgroundColor'))
    set(hObject, 'BackgroundColor', 'white');
end

function Ohm_Callback(hObject, eventdata, handles)
% hObject    handle to Ohm (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hints: get(hObject,'String') returns contents of Ohm as text
% str2double(get(hObject,'String')) returns contents of Ohm as a double

handles.Ohm = str2double(get(hObject, 'string'));
if isnan(handles.Ohm)
    errordlg('you must enter a numeric value', 'Error')
end
guidata(hObject, handles)

% --- Executes during object creation, after setting all properties.
function Ohm_CreateFcn(hObject, eventdata, handles)
% hObject    handle to Ohm (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    empty - handles not created until after all CreateFcns called

% Hint: edit controls usually have a white background on Windows.
% See ISPC and COMPUTER.
if ispc && isequal(get(hObject, 'BackgroundColor'),
    get(0, 'defaultUicontrolBackgroundColor'))
    set(hObject, 'BackgroundColor', 'white');
end

function Kr_Callback(hObject, eventdata, handles)
% hObject    handle to Kr (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hints: get(hObject,'String') returns contents of Kr as text
% str2double(get(hObject,'String')) returns contents of Kr as a double

% --- Executes during object creation, after setting all properties.
function Kr_CreateFcn(hObject, eventdata, handles)
    % hObject    handle to Kr (see GCBO)
    % eventdata  reserved - to be defined in a future version of MATLAB
    % handles    empty - handles not created until after all CreateFcns called

% Hint: edit controls usually have a white background on Windows.
% See ISPC and COMPUTER.
if ispc && isequal(get(hObject,'BackgroundColor'),
    get(0,'defaultUicontrolBackgroundColor'))
    set(hObject,'BackgroundColor','white');
end

function ALF_Callback(hObject, eventdata, handles)
    % hObject    handle to ALF (see GCBO)
    % eventdata  reserved - to be defined in a future version of MATLAB
    % handles    structure with handles and user data (see GUIDATA)

% Hints: get(hObject,'String') returns contents of ALF as text
%        str2double(get(hObject,'String')) returns contents of ALF as a double

handles.ALF=str2double(get(hObject,'string'));
if isnan(handles.ALF)
    errordlg('you must enter a numeric value','Error')
end
guidata(hObject,handles)

% --- Executes during object creation, after setting all properties.
function ALF_CreateFcn(hObject, eventdata, handles)
    % hObject    handle to ALF (see GCBO)
    % eventdata  reserved - to be defined in a future version of MATLAB
    % handles    empty - handles not created until after all CreateFcns called

% Hint: edit controls usually have a white background on Windows.
% See ISPC and COMPUTER.
if ispc && isequal(get(hObject,'BackgroundColor'),
    get(0,'defaultUicontrolBackgroundColor'))
    set(hObject,'BackgroundColor','white');
end

% --- Executes on button press in pushbutton2.
function pushbutton2_Callback(hObject, eventdata, handles)
    % hObject    handle to pushbutton2 (see GCBO)
    % eventdata  reserved - to be defined in a future version of MATLAB
    % handles    structure with handles and user data (see GUIDATA)

% To calculate the Dc times constant of the applicable fault loop
T1=((handles.Xr)/(2*pi*(handles.f)));

handles.Kr=str2double(get(hObject,'string'));
if isnan(handles.Kr)
    errordlg('you must enter a numeric value','Error')
end
guidata(hObject,handles)
set(handles.T1,'string',T1);

% To calculate the Source impedance
Zs=handles.Vs*1000/(sqrt(3)*handles.If*1000);
set(handles.Zs,'string',Zs);

% To calculate the Real part of Source impedance
Rs=(1.1)*(Zs)*((cos((83.08*pi)/180)));
set(handles.Rs,'string',Rs);

% To calculate the Imag part of Source impedance
Xs=(1.1)*(Zs)*((sin((83.08*pi)/180)));
set(handles.Xs,'string',Xs);

% To Calculate the Actual Source impedance
Zbs=sqrt(Rs^2+Xs^2);
set(handles.Zbs,'string',Zbs);

% To Calculate the Real part of Line Impedance
Rl=(0.2887)*(0.8)*(handles.L)*(cos((83.08*pi)/180));
set(handles.Rl,'string',Rl);

% To Calculate the Imag part of Line Impedance
Xl=(0.2887)*(0.8)*(handles.L)*(sin((83.08*pi)/180));
set(handles.Xl,'string',Xl);

% To calculate the Actual Line Impedance
Zbl=sqrt(Rl^2+Xl^2);
set(handles.Zbl,'string',Zbl);

% To calculate the Lead resistance
RL=2*(handles.Ic)*(handles.Cr);
set(handles.RL,'string',RL);

% To calculate the overall Total impedance
ZT=sqrt(((Rs+Rl)^2)+((Xs+Xl)^2));
set(handles.ZT,'string',ZT);

% To calculate the transient overdimensioning factor
Ktf=0.75;
set(handles.Ktf,'string',Ktf);

% To calculate the transient overdimensioning that consider remanence
Krem=1/(1-(1-handles.Kr));
set(handles.Krem,'string',Krem);

% to calculate full load current in primary
Ip=(handles.MVA*1000000)/(handles.Vs*1000*sqrt(3));
set(handles.Ip,'string',Ip);

% --- Executes on button press in pushbutton3.
function pushbutton3_Callback(hObject, eventdata, handles)
% hObject    handle to pushbutton3 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)
core45;
% --- Executes on button press in pushbutton4.
function pushbutton4_Callback(hObject, eventdata, handles)
% hObject handle to pushbutton4 (see GCBO)
% eventdata reserved - to be defined in a future version of MATLAB
% handles structure with handles and user data (see GUIDATA)

Ktf=0.75;
Zs=handles.Vs*1000/(sqrt(3)*handles.if*1000);
If1=(1.1*(handles.Vs*1000/sqrt(3)))/Zs;
ALF1=(If1/(handles.Ip1))*Ktf;
set(handles.ALF1,'string',ALF1);

RL=2*(handles.Ic)*(handles.Cr);
Rct1=(handles.Ip1)*(handles.ohm);
Rb=RL+(handles.Rr);
% To calculate Actual Accuracy Limit factor
Pi=(handles.Ip3)*Rct1;
Pn=handles.VA1;
Pb=(handles.Ip3)*((RL+(handles.Rr)));
ALF2=(ALF1)*((Pi+Pb)/(Pi+Pn));
set(handles.ALF2,'string',ALF2);

% To calculate Actual knee point Voltage
Vknee1=(ALF2)*(handles.Ip3)*(Rct1+Rb);
set(handles.Vknee1,'string',Vknee1);
% To calculate Actual Burden
VA2=(Vknee1/ALF2)-Rct1;
set(handles.VA2,'string',VA2);

% --- Executes on button press in pushbutton5.
function pushbutton5_Callback(hObject, eventdata, handles)
% hObject handle to pushbutton5 (see GCBO)
% eventdata reserved - to be defined in a future version of MATLAB
% handles structure with handles and user data (see GUIDATA)

% --- Executes on button press in Zs.
function Zs_Callback(hObject, eventdata, handles)
% hObject handle to Zs (see GCBO)
% eventdata reserved - to be defined in a future version of MATLAB
% handles structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of Zs
% --- Executes on button press in pushbutton6.
function pushbutton6_Callback(hObject, eventdata, handles)
% hObject handle to pushbutton6 (see GCBO)
% eventdata reserved - to be defined in a future version of MATLAB
% handles structure with handles and user data (see GUIDATA)

% --- Executes on button press in Zbs.
function Zbs_Callback(hObject, eventdata, handles)
% hObject handle to Zbs (see GCBO)
% eventdata reserved - to be defined in a future version of MATLAB
% handles structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of Zbs
% --- Executes on button press in pushbutton7.
function pushbutton7_Callback(hObject, eventdata, handles)
% hObject    handle to pushbutton7 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% --- Executes on button press in Rs.
function Rs_Callback(hObject, eventdata, handles)
% hObject    handle to Rs (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of Rs

% --- Executes on button press in pushbutton8.
function pushbutton8_Callback(hObject, eventdata, handles)
% hObject    handle to pushbutton8 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% --- Executes on button press in Xs.
function Xs_Callback(hObject, eventdata, handles)
% hObject    handle to Xs (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of Xs

% --- Executes on button press in pushbutton9.
function pushbutton9_Callback(hObject, eventdata, handles)
% hObject    handle to pushbutton9 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% --- Executes on button press in togglebutton5.
function togglebutton5_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton5 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of togglebutton5

% --- Executes on button press in pushbutton10.
function pushbutton10_Callback(hObject, eventdata, handles)
% hObject    handle to pushbutton10 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% --- Executes on button press in Zbl.
function Zbl_Callback(hObject, eventdata, handles)
% hObject    handle to Zbl (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of Zbl

% --- Executes on button press in pushbutton11.
function pushbutton11_Callback(hObject, eventdata, handles)
% hObject    handle to pushbutton11 (see GCBO)
% eventdata reserved - to be defined in a future version of MATLAB
% handles structure with handles and user data (see GUIDATA)

% --- Executes on button press in togglebutton7.
function togglebutton7_Callback(hObject, eventdata, handles)
% hObject handle to togglebutton7 (see GCBO)
% eventdata reserved - to be defined in a future version of MATLAB
% handles structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of togglebutton7

% --- Executes on button press in pushbutton12.
function pushbutton12_Callback(hObject, eventdata, handles)
% hObject handle to pushbutton12 (see GCBO)
% eventdata reserved - to be defined in a future version of MATLAB
% handles structure with handles and user data (see GUIDATA)

% --- Executes on button press in T1.
function T1_Callback(hObject, eventdata, handles)
% hObject handle to T1 (see GCBO)
% eventdata reserved - to be defined in a future version of MATLAB
% handles structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of T1

% --- Executes on button press in Rl.
function Rl_Callback(hObject, eventdata, handles)
% hObject handle to Rl (see GCBO)
% eventdata reserved - to be defined in a future version of MATLAB
% handles structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of Rl

% --- Executes on button press in Xl.
function Xl_Callback(hObject, eventdata, handles)
% hObject handle to Xl (see GCBO)
% eventdata reserved - to be defined in a future version of MATLAB
% handles structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of Xl

% --- Executes on button press in pushbutton13.
function pushbutton13_Callback(hObject, eventdata, handles)
% hObject handle to pushbutton13 (see GCBO)
% eventdata reserved - to be defined in a future version of MATLAB
% handles structure with handles and user data (see GUIDATA)

% --- Executes on button press in togglebutton9.
function togglebutton9_Callback(hObject, eventdata, handles)
% hObject handle to togglebutton9 (see GCBO)
% eventdata reserved - to be defined in a future version of MATLAB
% handles structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of togglebutton9

% --- Executes on button press in pushbutton14.
function pushbutton14_Callback(hObject, eventdata, handles)
    % hObject    handle to pushbutton14 (see GCBO)
    % eventdata  reserved - to be defined in a future version of MATLAB
    % handles    structure with handles and user data (see GUIDATA)

    % --- Executes on button press in ZT.
function ZT_Callback(hObject, eventdata, handles)
    % hObject    handle to ZT (see GCBO)
    % eventdata  reserved - to be defined in a future version of MATLAB
    % handles    structure with handles and user data (see GUIDATA)

    % Hint: get(hObject,'Value') returns toggle state of ZT

    % --- Executes on button press in pushbutton15.
function pushbutton15_Callback(hObject, eventdata, handles)
    % hObject    handle to pushbutton15 (see GCBO)
    % eventdata  reserved - to be defined in a future version of MATLAB
    % handles    structure with handles and user data (see GUIDATA)

    % --- Executes on button press in Ktf.
function Ktf_Callback(hObject, eventdata, handles)
    % hObject    handle to Ktf (see GCBO)
    % eventdata  reserved - to be defined in a future version of MATLAB
    % handles    structure with handles and user data (see GUIDATA)

    % Hint: get(hObject,'Value') returns toggle state of Ktf

    % --- Executes on button press in pushbutton16.
function pushbutton16_Callback(hObject, eventdata, handles)
    % hObject    handle to pushbutton16 (see GCBO)
    % eventdata  reserved - to be defined in a future version of MATLAB
    % handles    structure with handles and user data (see GUIDATA)

    % --- Executes on button press in Krem.
function Krem_Callback(hObject, eventdata, handles)
    % hObject    handle to Krem (see GCBO)
    % eventdata  reserved - to be defined in a future version of MATLAB
    % handles    structure with handles and user data (see GUIDATA)

    % Hint: get(hObject,'Value') returns toggle state of Krem

    % --- Executes on button press in pushbutton17.
function pushbutton17_Callback(hObject, eventdata, handles)
    % hObject    handle to pushbutton17 (see GCBO)
    % eventdata  reserved - to be defined in a future version of MATLAB
    % handles    structure with handles and user data (see GUIDATA)

    % --- Executes on button press in RL.
function RL_Callback(hObject, eventdata, handles)
    % hObject    handle to RL (see GCBO)
    % eventdata  reserved - to be defined in a future version of MATLAB
    % handles    structure with handles and user data (see GUIDATA)

    % Hint: get(hObject,'Value') returns toggle state of RL

    % --- Executes on button press in Ip.
function Ip_Callback(hObject, eventdata, handles)
    % hObject    handle to Ip (see GCBO)
function togglebutton13_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton13 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)
% Hint: get(hObject,'Value') returns toggle state of togglebutton13

function togglebutton14_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton14 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)
% Hint: get(hObject,'Value') returns toggle state of togglebutton14

function togglebutton15_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton15 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)
% Hint: get(hObject,'Value') returns toggle state of togglebutton15

function togglebutton17_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton17 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)
% Hint: get(hObject,'Value') returns toggle state of togglebutton17

function togglebutton18_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton18 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)
% Hint: get(hObject,'Value') returns toggle state of togglebutton18

function If1_Callback(hObject, eventdata, handles)
% hObject    handle to If1 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)
% Hint: get(hObject,'Value') returns toggle state of If1

function If2_Callback(hObject, eventdata, handles)
% hObject    handle to If2 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)
% Hint: get(hObject,'Value') returns toggle state of If2
% --- Executes on button press in pushbutton18.
function pushbutton18_Callback(hObject, eventdata, handles)

% hObject    handle to pushbutton18 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

function MVA_Callback(hObject, eventdata, handles)
% hObject    handle to MVA (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hints: get(hObject,'String') returns contents of MVA as text
% str2double(get(hObject,'String')) returns contents of MVA as a double

handles.Vs=str2double(get(hObject,'String'));
if isnan(handles.Vs)
    errordlg('you must enter a numeric value','Error')
end
guidata(hObject,handles)

% --- Executes during object creation, after setting all properties.
function MVA_CreateFcn(hObject, eventdata, handles)
% hObject    handle to MVA (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    empty - handles not created until after all CreateFcns called

% Hint: edit controls usually have a white background on Windows.
% See ISPC and COMPUTER.
if ispc && isequal(get(hObject,'BackgroundColor'),
    get(0,'defaultUicontrolBackgroundColor'))
    set(hObject,'BackgroundColor','white');
end

% --- Executes on button press in togglebutton21.
function togglebutton21_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton21 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of togglebutton21

% --- Executes on button press in togglebutton22.
function togglebutton22_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton22 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of togglebutton22

% --- Executes on button press in togglebutton23.
function togglebutton23_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton23 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)
% Hint: get(hObject,'Value') returns toggle state of togglebutton23

function togglebutton23_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton23 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of togglebutton24

function togglebutton24_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton24 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of togglebutton25

function togglebutton25_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton25 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of togglebutton26

function togglebutton26_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton26 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of togglebutton27

function togglebutton27_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton27 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of togglebutton28

function togglebutton28_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton28 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of togglebutton29

function togglebutton29_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton29 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of togglebutton30

function togglebutton30_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton30 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)
% Hint: get(hObject,'Value') returns toggle state of togglebutton30

% --- Executes on button press in togglebutton31.
function togglebutton31_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton31 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of togglebutton31

% --- Executes on button press in togglebutton32.
function togglebutton32_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton32 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of togglebutton32

% --- Executes on button press in togglebutton33.
function togglebutton33_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton33 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of togglebutton33

% --- Executes on button press in togglebutton34.
function togglebutton34_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton34 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of togglebutton34

% --- Executes on button press in togglebutton35.
function togglebutton35_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton35 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of togglebutton35

% --- Executes on button press in togglebutton36.
function togglebutton36_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton36 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of togglebutton36

% --- Executes on button press in togglebutton37.
function togglebutton37_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton37 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of togglebutton37
% Hint: get(hObject,'Value') returns toggle state of togglebutton37

% --- Executes on button press in togglebutton38.
function togglebutton38_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton38 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of togglebutton38
% --- Executes on button press in togglebutton39.
function togglebutton39_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton39 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of togglebutton39
% --- Executes on button press in togglebutton40.
function togglebutton40_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton40 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of togglebutton40
% --- Executes on button press in togglebutton41.
function togglebutton41_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton41 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of togglebutton41
% --- Executes on button press in togglebutton42.
function togglebutton42_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton42 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of togglebutton42
% --- Executes on button press in pushbutton22.
function pushbutton22_Callback(hObject, eventdata, handles)
% hObject    handle to pushbutton22 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% --- Executes on button press in Rct1.
function Rct1_Callback(hObject, eventdata, handles)
% hObject    handle to Rct1 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)
% Hint: get(hObject,'Value') returns toggle state of Rct1

% --- Executes on button press in togglebutton43.
function togglebutton43_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton43 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of togglebutton43

% --- Executes on button press in togglebutton44.
function togglebutton44_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton44 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)
% Hint: get(hObject,'Value') returns toggle state of togglebutton44

% --- Executes on button press in togglebutton45.
function togglebutton45_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton45 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)
% Hint: get(hObject,'Value') returns toggle state of togglebutton45

% --- Executes on button press in togglebutton46.
function togglebutton46_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton46 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)
% Hint: get(hObject,'Value') returns toggle state of togglebutton46

% --- Executes on button press in togglebutton47.
function togglebutton47_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton47 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)
% Hint: get(hObject,'Value') returns toggle state of togglebutton47

% --- Executes on button press in togglebutton48.
function togglebutton48_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton48 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)
% Hint: get(hObject,'Value') returns toggle state of togglebutton48

% --- Executes on button press in togglebutton49.
function togglebutton49_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton49 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)
% Hint: get(hObject,'Value') returns toggle state of togglebutton49

% --- Executes on button press in togglebutton50.
function togglebutton50_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton50 (see GCBO)
% eventdata reserved - to be defined in a future version of MATLAB
% handles structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of togglebutton50

% --- Executes on button press in togglebutton51.
function togglebutton51_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton51 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of togglebutton51

% --- Executes on button press in togglebutton52.
function togglebutton52_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton52 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of togglebutton52

% --- Executes on button press in togglebutton53.
function togglebutton53_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton53 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of togglebutton53

% --- Executes on button press in togglebutton54.
function togglebutton54_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton54 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of togglebutton54

% --- Executes on button press in togglebutton55.
function togglebutton55_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton55 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of togglebutton55

% --- Executes on button press in togglebutton56.
function togglebutton56_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton56 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of togglebutton56

% --- Executes on button press in togglebutton57.
function togglebutton57_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton57 (see GCBO)
% eventdata reserved - to be defined in a future version of MATLAB
% handles structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of togglebutton57

% --- Executes on button press in togglebutton58.
function togglebutton58_Callback(hObject, eventdata, handles)
% hObject handle to togglebutton58 (see GCBO)
% eventdata reserved - to be defined in a future version of MATLAB
% handles structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of togglebutton58

% --- Executes on button press in togglebutton59.
function togglebutton59_Callback(hObject, eventdata, handles)
% hObject handle to togglebutton59 (see GCBO)
% eventdata reserved - to be defined in a future version of MATLAB
% handles structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of togglebutton59

% --- Executes on button press in togglebutton60.
function togglebutton60_Callback(hObject, eventdata, handles)
% hObject handle to togglebutton60 (see GCBO)
% eventdata reserved - to be defined in a future version of MATLAB
% handles structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of togglebutton60

% --- Executes on button press in togglebutton61.
function togglebutton61_Callback(hObject, eventdata, handles)
% hObject handle to togglebutton61 (see GCBO)
% eventdata reserved - to be defined in a future version of MATLAB
% handles structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of togglebutton61

% --- Executes on button press in togglebutton62.
function togglebutton62_Callback(hObject, eventdata, handles)
% hObject handle to togglebutton62 (see GCBO)
% eventdata reserved - to be defined in a future version of MATLAB
% handles structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of togglebutton62

% --- Executes on button press in togglebutton63.
function togglebutton63_Callback(hObject, eventdata, handles)
% hObject handle to togglebutton63 (see GCBO)
% eventdata reserved - to be defined in a future version of MATLAB
% handles structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of togglebutton63

% --- Executes on button press in togglebutton64.
function togglebutton64_Callback(hObject, eventdata, handles)
% hObject handle to togglebutton64 (see GCBO)
% eventdata reserved – to be defined in a future version of MATLAB
% handles structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of togglebutton64

% --- Executes on button press in togglebutton65.
function togglebutton65_Callback(hObject, eventdata, handles)
% hObject handle to togglebutton65 (see GCBO)
% eventdata reserved – to be defined in a future version of MATLAB
% handles structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of togglebutton65

% --- Executes on button press in togglebutton66.
function togglebutton66_Callback(hObject, eventdata, handles)
% hObject handle to togglebutton66 (see GCBO)
% eventdata reserved – to be defined in a future version of MATLAB
% handles structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of togglebutton66

% --- Executes on button press in togglebutton67.
function togglebutton67_Callback(hObject, eventdata, handles)
% hObject handle to togglebutton67 (see GCBO)
% eventdata reserved – to be defined in a future version of MATLAB
% handles structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of togglebutton67

% --- Executes on button press in togglebutton68.
function togglebutton68_Callback(hObject, eventdata, handles)
% hObject handle to togglebutton68 (see GCBO)
% eventdata reserved – to be defined in a future version of MATLAB
% handles structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of togglebutton68

% --- Executes during object creation, after setting all properties.
function ALF20_CreateFcn(hObject, eventdata, handles)
% hObject handle to ALF20 (see GCBO)
% eventdata reserved – to be defined in a future version of MATLAB
% handles empty – handles not created until after all CreateFcns called

% Hint: edit controls usually have a white background on Windows.
% See ISPC and COMPUTER.
if ispc & & isequal(get(hObject,'BackgroundColor'),
get(0,'defaultUicontrolBackgroundColor'))
    set(hObject,'BackgroundColor','white');
end

% --- Executes on button press in pushbutton23.
function pushbutton23_Callback(hObject, eventdata, handles)
% hObject handle to pushbutton23 (see GCBO)
% eventdata reserved – to be defined in a future version of MATLAB
% handles structure with handles and user data (see GUIDATA)
x1=[0.0010 0.0020 0.0040 0.0050 0.0080 0.0100 0.0200 0.0400 0.0500
0.0800 0.1000 0.2000 0.4000 0.5000 0.8000 1.000]
y1=[2.8 5.6 20.3 28.0 57.5 65.9 1 67.8 71.2 736.8 744.4 760.0 767.8]
y2=[2.8 5.6 19.4 26.7 48.4 67.4 184.4 471.2 559.2 646.7 667.1 705.2
730.0 737.4 753.4 761.8]
y3=[3.6 7.2 18.0 24.8 47.6 67.0 179.4 438.4 521.0 615.7 642.8 703.4
741.4 750.7 768.3 776.6]

figure
axes('FontSize',13)
loglog(x1,y1,'ro','LineWidth',1.0,'MarkerEdgeColor','r','MarkerFaceColor','g','MarkerSize',2)
hold on
loglog(x1,y2,'yo','LineWidth',1.0,'MarkerEdgeColor','r','MarkerFaceColor','r','MarkerSize',2)
hold on
loglog(x1,y3,'bo','LineWidth',1.0,'MarkerEdgeColor','r','MarkerFaceColor','w','MarkerSize',2)
hold off
h = legend('Red Phase','Yellow Phase','Blue Phase',10);
gtext on
xlabel({['Current in mA';'Current']})
ylabel({['Voltage in V';'Voltage']})
title('CT SATURATION PLOT','FontSize',15,'Fontweight','b')
text(0.0580,591.4,'(0.0528,591.4)','FontSize',10,'Fontweight','b')
text(0.0580,582.5,'(0.0540,582.5)','FontSize',10,'Fontweight','b')
text(0.0580,576.9,'(0.0626,576.9)','FontSize',10,'Fontweight','b')
text(0.01,14,'ASA 10/50Vkp:CT R = 591.4 V; CT Y = 582.5V; CT B = 576.9V','FontSize',12,'Fontweight','b')
text(0.01,11,'Vkp = 295.7V;291.25V;288.45V','FontSize',12,'Fontweight','b')
function varargout = core45(varargin)

% CORE45 M-file for core45.fig
% CORE45, by itself, creates a new CORE45 or raises the existing
% singleton*.
% H = CORE45 returns the handle to a new CORE45 or the handle to
% the existing singleton*.
% CORE45('CALLBACK',hObject,eventData,handles,...) calls the local
% function named CALLBACK in CORE45.M with the given input
% arguments.
% CORE45('Property','Value',...) creates a new CORE45 or raises the
% existing singleton*. Starting from the left, property value
% pairs are
% applied to the GUI before core45_OpeningFunction gets called. An
% unrecognized property name or invalid value makes property
% application
% stop. All inputs are passed to core45_OpeningFcn via varargin.
% *See GUI Options on GUIDE's Tools menu. Choose "GUI allows only
% one
% instance to run (singleton)".

% See also: GUIDE, GUIDATA, GUIDATA

% Edit the above text to modify the response to help core45

% Last Modified by GUIDE v2.5 12-Nov-2009 15:35:50

% Begin initialization code - DO NOT EDIT
gui_Singleton = 1;
 gui_State = struct('gui_Name', mfilename, ...
 'gui_Singleton', gui_Singleton, ...
 'gui_OpeningFcn', @core45_OpeningFcn, ...
 'gui_OutputFcn', @core45_OutputFcn, ...
 'gui_LayoutFcn', [], ..., ...
 'gui_Callback', []);

if nargin && ischar(varargin{1})
    gui_State.gui_Callback = str2func(varargin{1});
end

if nargout
    [varargout{1:nargout}] = gui_mainfcn(gui_State, varargin{:});
else
    gui_mainfcn(gui_State, varargin{:});
end

% End initialization code - DO NOT EDIT
% --- Executes just before core45 is made visible.
function core45_OpeningFcn(hObject, eventdata, handles, varargin)
% This function has no output args, see OutputFcn.
% hObject    handle to figure
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)
% varargin    command line arguments to core45 (see VARARGIN)
backgroundImage = importdata('mcag34.jpg');
axes(handles.mcag34_pic);
image(backgroundImage);
axis off
% Choose default command line output for core45
handles.output = hObject;

% Update handles structure
guidata(hObject, handles);

% UIWAIT makes core45 wait for user response (see UIRESUME)
% uiwait(handles.figure1);

% --- Outputs from this function are returned to the command line.
function varargout = core45_OutputFcn(hObject, eventdata, handles)
% varargout  cell array for returning output args (see VARARGOUT);
% hObject    handle to figure
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)
% Get default command line output from handles structure
varargout{1} = handles.output;

% --- Executes on button press in togglebutton1.
function togglebutton1_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton1 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)
% Hint: get(hObject,'Value') returns toggle state of togglebutton1

% --- Executes on button press in togglebutton2.
function togglebutton2_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton2 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)
% Hint: get(hObject,'Value') returns toggle state of togglebutton2

% --- Executes on button press in togglebutton3.
function togglebutton3_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton3 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)
% Hint: get(hObject,'Value') returns toggle state of togglebutton3
% --- Executes on button press in togglebutton4.
function togglebutton4_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton4 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)
% Hint: get(hObject,'Value') returns toggle state of togglebutton4

% --- Executes on button press in pushbutton1.
function pushbutton1_Callback(hObject, eventdata, handles)
% hObject    handle to pushbutton1 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% To calculate highest CT Secondary resistance
Rct1=(handles.Ip1)*(handles.ohm);
set(handles.Rct1,'string',Rct1);

% to calculate the Ext.Fault Current for 1st ratio
RL=2*(handles.Ic)*(handles.Cr);
Isf=handles.If*1000/handles.Ip1;
Vm=(Isf)*(Rct1+RL);
set(handles.Vm,'string',Vm);

% To calculate Knee point Voltage
Vknee=3*Vm;
set(handles.Vknee,'string',Vknee);

% To calculate Accurate Burden
VA=(Vknee(handles.ALF))/Rct1;
set(handles.VA,'string',VA);

% --- Executes on button press in pushbutton2.
function pushbutton2_Callback(hObject, eventdata, handles)
% hObject    handle to pushbutton2 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

Ktf=0.75;
Zs=handles.Vs*1000/(sqrt(3)*handlers.If*1000);
If1=(1.1*(handles.Vs*1000/sqrt(3)))/Zs;
ALF1=(If1/handles.Ip1)*Ktf;
set(handles.ALF1,'string',ALF1);

RL=2*(handles.Ic)*(handles.Cr);
Rct1=(handles.Ip1)*(handles.ohm);
Rb=RL+(handles.Rr);

% To calculate Actual Accuracy Limit factor
Pi=(handles.Ip3)*Rct1;
Pn=handles.VA1;
Pb=(handles.Ip3)*(Rl+(handles.Rr));
ALF2=(ALF1)*((Pi+Pb)/(Pi+Pn));
set(handles.ALF2,'string',ALF2);

% To calculate Actual knee point Voltage
Vknee1=(ALF2)*(handles.Ip3)*(Rct1+Rb);
set(handles.Vknee1,'string',Vknee1);

% To calculate Actual Burden
VA2=(Vknee1/ALF2)-Rct1;
set(handles.VA2,'string',VA2);
% Compare the Accuracy Limit Factor
i=1;
if ALF2<=handles.ALF2 && Vknee1<=handles.Vknee2 && VA2<=handles.VA2
    e{i}=sprintf('CT is Adequate\n');
else
    e{i}=sprintf('CT is not Adequate\n');
end
handles.list={e};
set(handles.status,'string',handles.list);
guidata(hObject, handles);

% --- Executes on button press in togglebutton5.
function togglebutton5_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton5 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)
% Hint: get(hObject,'Value') returns toggle state of togglebutton5

% --- Executes on button press in togglebutton6.
function togglebutton6_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton6 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)
% Hint: get(hObject,'Value') returns toggle state of togglebutton6

% --- Executes on button press in togglebutton7.
function togglebutton7_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton7 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)
% Hint: get(hObject,'Value') returns toggle state of togglebutton7

% --- Executes on button press in togglebutton8.
function togglebutton8_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton8 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)
% Hint: get(hObject,'Value') returns toggle state of togglebutton8

% --- Executes on button press in togglebutton9.
function togglebutton9_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton9 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)
% Hint: get(hObject,'Value') returns toggle state of togglebutton9

% --- Executes on button press in togglebutton10.
function togglebutton10_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton10 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)
% Hint: get(hObject,'Value') returns toggle state of togglebutton10
% --- Executes on button press in togglebutton11.
function togglebutton11_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton11 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of togglebutton11

% --- Executes on button press in togglebutton12.
function togglebutton12_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton12 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of togglebutton12

% --- Executes on button press in togglebutton13.
function togglebutton13_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton13 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of togglebutton13

% --- Executes on button press in togglebutton14.
function togglebutton14_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton14 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of togglebutton14

% --- Executes on button press in togglebutton15.
function togglebutton15_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton15 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of togglebutton15

% --- Executes on button press in togglebutton16.
function togglebutton16_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton16 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of togglebutton16

% --- Executes on button press in togglebutton17.
function togglebutton17_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton17 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of togglebutton17
% --- Executes on button press in togglebutton18.
function togglebutton18_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton18 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of togglebutton18

% --- Executes on button press in togglebutton19.
function togglebutton19_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton19 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of togglebutton19

% --- Executes on button press in togglebutton20.
function togglebutton20_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton20 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of togglebutton20

% --- Executes on button press in togglebutton21.
function togglebutton21_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton21 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of togglebutton21

function Ip2_Callback(hObject, eventdata, handles)
% hObject    handle to Ip2 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hints: get(hObject,'String') returns contents of Ip2 as text
%        str2double(get(hObject,'String')) returns contents of Ip2 as a double

% --- Executes during object creation, after setting all properties.
function Ip2_CreateFcn(hObject, eventdata, handles)
% hObject    handle to Ip2 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    empty - handles not created until after all CreateFcns called

% Hint: edit controls usually have a white background on Windows.
%       See ISPC and COMPUTER.
if ispc &
    set(hObject,'BackgroundColor','white');
end
function Ip3_Callback(hObject, eventdata, handles)
% hObject    handle to Ip3 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hints: get(hObject,'String') returns contents of Ip3 as text
%        str2double(get(hObject,'String')) returns contents of Ip3 as a
double

handles.Ip3=str2double(get(hObject,'string'));
if isnan(handles.Ip3)
    errordlg('you must enter a numeric value','Error')
end
guida(hObject,handles)

% --- Executes during object creation, after setting all properties.
function Ip3_CreateFcn(hObject, eventdata, handles)
% hObject    handle to Ip3 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    empty - handles not created until after all CreateFcns
called

% Hint: edit controls usually have a white background on Windows.
%       See ISPC and COMPUTER.
if ispc && isequal(get(hObject,'BackgroundColor'),
    get(0,'defaultUicontrolBackgroundColor'))
    set(hObject,'BackgroundColor','white');
end

% --- Executes on button press in Rct1.
function Rct1_Callback(hObject, eventdata, handles)
% hObject    handle to Rct1 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of Rct1

function Rr_Callback(hObject, eventdata, handles)
% hObject    handle to Rr (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hints: get(hObject,'String') returns contents of Rr as text
%        str2double(get(hObject,'String')) returns contents of Rr as a
double

handles.Rr=str2double(get(hObject,'string'));
if isnan(handles.Rr)
    errordlg('you must enter a numeric value','Error')
end
guida(hObject,handles)

% --- Executes during object creation, after setting all properties.
function Rr_CreateFcn(hObject, eventdata, handles)
% hObject    handle to Rr (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    empty - handles not created until after all CreateFcns
called
% Hint: edit controls usually have a white background on Windows.
% See ISPC and COMPUTER.
if ispc && isequal(get(hObject,'BackgroundColor'),
get(0,'defaultUicontrolBackgroundColor'))
    set(hObject,'BackgroundColor','white');
end

function VA1_Callback(hObject, eventdata, handles)
% hObject    handle to VA1 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hints: get(hObject,'String') returns contents of VA1 as text
%       str2double(get(hObject,'String')) returns contents of VA1 as a double

handles.VA1=str2double(get(hObject,'string'));
if isnan(handles.VA1)
    errordlg('you must enter a numeric value','Error')
end
guidata(hObject,handles)

% --- Executes during object creation, after setting all properties.
function VA1_CreateFcn(hObject, eventdata, handles)
% hObject    handle to VA1 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    empty - handles not created until after all CreateFcns called

% Hint: edit controls usually have a white background on Windows.
% See ISPC and COMPUTER.
if ispc && isequal(get(hObject,'BackgroundColor'),
get(0,'defaultUicontrolBackgroundColor'))
    set(hObject,'BackgroundColor','white');
end
% --- Executes on button press in pushbutton3.
function pushbutton3_Callback(hObject, eventdata, handles)
% hObject    handle to pushbutton3 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

function Vs_Callback(hObject, eventdata, handles)
% hObject    handle to Vs (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hints: get(hObject,'String') returns contents of Vs as text
%       str2double(get(hObject,'String')) returns contents of Vs as a double

handles.Vs=str2double(get(hObject,'string'));
if isnan(handles.Vs)
    errordlg('you must enter a numeric value','Error')
end
guidata(hObject,handles)

% --- Executes during object creation, after setting all properties.
function Vs_CreateFcn(hObject, eventdata, handles)
% hObject    handle to Vs (see GCBO)
% eventdata reserved - to be defined in a future version of MATLAB
% handles empty - handles not created until after all CreateFcns called

% Hint: edit controls usually have a white background on Windows.
%      See ISPC and COMPUTER.
if ispc && isequal(get(hObject,'BackgroundColor'),
    get(0,'defaultUicontrolBackgroundColor'))
    set(hObject,'BackgroundColor','white');
end

% --- Executes on button press in togglebutton23.
function togglebutton23_Callback(hObject, eventdata, handles)

% hObject    handle to togglebutton23 (see GCBO)
% eventdata reserved - to be defined in a future version of MATLAB
% handles   structure with handles and user data (see GUIDATA)

% To calculate the Dc times constant of the applicable fault loop
T1=((handles.Xr)/(2*pi*(handles.f)));
set(handles.T1,'string',T1);

% To calculate the Source impedance
Zs=handles.Vs*1000/(sqrt(3)*handles.If*1000);
set(handles.Zs,'string',Zs);

% To calculate the Real part of Source impedance
Rs=(1.1)*(Zs)*((cos((83.08*pi)/180)));
set(handles.Rs,'string',Rs);

% To calculate the imag part of Source impedance
Xs=(1.1)*(Zs)*((sin((83.08*pi)/180)));
set(handles.Xs,'string',Xs);

% To Calculate the Actual Source impedance
Zbs=sqrt(Rs^2+Xs^2);
set(handles.Zbs,'string',Zbs);

% To calculate the real part of Line Impedance
Rl=(0.2887)*(0.8)*(handles.L)*(cos((83.08*pi)/180));
set(handles.Rl,'string',Rl);

% To Calculate the Imag part of Line Impedance
Xl=(0.2887)*(0.8)*(handles.L)*(sin((83.08*pi)/180));
set(handles.Xl,'string',Xl);

% To calculate the Actual Line Impedance
Zbl=sqrt(Rl^2+Xl^2);
set(handles.Zbl,'string',Zbl);

% To calculate the Lead resistance
RL=2*(handles.Ic)*(handles.Cr);
set(handles.RL,'string',RL);

% To calculate the overall Total impedance
ZT=sqrt(((Rs+Rl)^2)+((Xs+Xl)^2));
set(handles.ZT,'string',ZT);

% To calculate the transient overdimensioning factor
Ktf=0.75;
set(handles.Ktf,'string',Ktf);

% To calculate the transient overdimensioning that consider remanence
Krem=1/((1-handles.Kr));
set(handles.Krem,'string',Krem);

% to calculate full load current in primary
Ip=(handles.MVA*1000000)/(handles.Vs*1000*sqrt(3));
set(handles.Ip,'string',Ip);

% Hint: get(hObject,'Value') returns toggle state of togglebutton23

% --- Executes on button press in Rb.
function Rb_Callback(hObject, eventdata, handles)
% hObject    handle to Rb (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of Rb
handles.Rb=str2double(get(hObject,'string'));
if isnan(handles.Rb)
    errordlg('you must enter a numeric value','Error')
end
guidata(hObject,handles)

% --- Executes on button press in togglebutton25.
function togglebutton25_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton25 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of togglebutton25
% --- Executes on button press in Ip.
function Ip_Callback(hObject, eventdata, handles)
% hObject    handle to Ip (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of Ip

% --- Executes on button press in togglebutton27.
function togglebutton27_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton27 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of togglebutton27

% --- Executes on button press in togglebutton28.
function togglebutton28_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton28 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)
% Hint: get(hObject,'Value') returns toggle state of togglebutton28

% --- Executes on button press in togglebutton29.
function togglebutton29_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton29 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of togglebutton29

function If_Callback(hObject, eventdata, handles)
% hObject    handle to If (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hints: get(hObject,'String') returns contents of If as text
%        str2double(get(hObject,'String')) returns contents of If as a double

handles.If=str2double(get(hObject,'String'));
if isnan(handles.If)
    errordlg('you must enter a numeric value','Error')
end

guidata(hObject,handles)

% --- Executes during object creation, after setting all properties.
function If_CreateFcn(hObject, eventdata, handles)
% hObject    handle to If (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    empty - handles not created until after all CreateFcns called

% Hint: edit controls usually have a white background on Windows.
%       See ISPC and COMPUTER.
if ispc && isequal(get(hObject,'BackgroundColor'),get(0,'defaultUicontrolBackgroundColor'))
    set(hObject,'BackgroundColor','white');
end

% --- Executes on button press in togglebutton30.
function togglebutton30_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton30 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of togglebutton30

function f_Callback(hObject, eventdata, handles)
% hObject    handle to f (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hints: get(hObject,'String') returns contents of f as text
%        str2double(get(hObject,'String')) returns contents of f as a double
handles.f=str2double(get(hObject,'string'));% --- Executes during object creation, after setting all properties.
function f_CreateFcn(hObject, eventdata, handles)
% hObject    handle to f (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    empty - handles not created until after all CreateFcns
called

% Hint: edit controls usually have a white background on Windows.
% See ISPC and COMPUTER.
if ispc && isequal(get(hObject,'BackgroundColor'),
    get(0,'defaultUicontrolBackgroundColor'))
    set(hObject,'BackgroundColor','white');
end

function Xr_Callback(hObject, eventdata, handles)
% hObject    handle to Xr (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)
% Hints: get(hObject,'String') returns contents of Xr as text
%        str2double(get(hObject,'String')) returns contents of Xr as a double

handles.Xr=str2double(get(hObject,'string'));% --- Executes during object creation, after setting all properties.
function Xr_CreateFcn(hObject, eventdata, handles)
% hObject    handle to Xr (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    empty - handles not created until after all CreateFcns
called

% Hint: edit controls usually have a white background on Windows.
% See ISPC and COMPUTER.
if ispc && isequal(get(hObject,'BackgroundColor'),
    get(0,'defaultUicontrolBackgroundColor'))
    set(hObject,'BackgroundColor','white');
end

function togglebutton31_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton31 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of togglebutton31

function Ic_Callback(hObject, eventdata, handles)
% hObject     handle to Ic (see GCBO)
% eventdata   reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hints: get(hObject,'String') returns contents of Ic as text
%       str2double(get(hObject,'String')) returns contents of Ic as a double

handles.Ic=str2double(get(hObject,'string'));
if isnan(handles.Ic)
    errordlg('you must enter a numeric value','Error')
end
guidata(hObject,handles)

% --- Executes during object creation, after setting all properties.
function Ic_CreateFcn(hObject, eventdata, handles)
% hObject     handle to Ic (see GCBO)
% eventdata   reserved - to be defined in a future version of MATLAB
% handles    empty - handles not created until after all CreateFcns called

% Hint: edit controls usually have a white background on Windows.
%       See ISPC and COMPUTER.
if ispc && isequal(get(hObject,'BackgroundColor'),
    get(0,'defaultUiControlBackgroundColor'))
    set(hObject,'BackgroundColor','white');
end

% --- Executes on button press in togglebutton32.
function togglebutton32_Callback(hObject, eventdata, handles)
% hObject     handle to togglebutton32 (see GCBO)
% eventdata   reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of togglebutton32

function Cc_Callback(hObject, eventdata, handles)
% hObject     handle to Cc (see GCBO)
% eventdata   reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hints: get(hObject,'String') returns contents of Cc as text
%        str2double(get(hObject,'String')) returns contents of Cc as a double

handles.Cc=str2double(get(hObject,'string'));
if isnan(handles.Cc)
    errordlg('you must enter a numeric value','Error')
end
guidata(hObject,handles)

% --- Executes during object creation, after setting all properties.
function Cc_CreateFcn(hObject, eventdata, handles)
% hObject     handle to Cc (see GCBO)
% eventdata   reserved - to be defined in a future version of MATLAB
% handles    empty - handles not created until after all CreateFcns called
% Hint: edit controls usually have a white background on Windows.  
%       See ISPC and COMPUTER.
if ispc && isequal(get(hObject,'BackgroundColor'),
get(0,'defaultUicontrolBackgroundColor'))
    set(hObject,'BackgroundColor','white');
end

% --- Executes on button press in togglebutton33.
function togglebutton33_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton33 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)
% Hint: get(hObject,'Value') returns toggle state of togglebutton33
function Cr_Callback(hObject, eventdata, handles)
% hObject    handle to Cr (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)
% Hints: get(hObject,'String') returns contents of Cr as text
%        str2double(get(hObject,'String')) returns contents of Cr as a double
handles.Cr=str2double(get(hObject,'string'));
if isnan(handles.Cr)
    errordlg('you must enter a numeric value','Error')
end
guidata(hObject,handles)

% --- Executes during object creation, after setting all properties.
function Cr_CreateFcn(hObject, eventdata, handles)
% hObject    handle to Cr (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    empty - handles not created until after all CreateFcns
% called
% Hint: edit controls usually have a white background on Windows.  
%       See ISPC and COMPUTER.
if ispc && isequal(get(hObject,'BackgroundColor'),
get(0,'defaultUicontrolBackgroundColor'))
    set(hObject,'BackgroundColor','white');
end

% --- Executes on button press in togglebutton34.
function togglebutton34_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton34 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)
% Hint: get(hObject,'Value') returns toggle state of togglebutton34
function L_Callback(hObject, eventdata, handles)
% hObject    handle to L (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)
% Hints: get(hObject,'String') returns contents of L as text
% str2double(get(hObject,'String')) returns contents of L as a double

handles.L=str2double(get(hObject,'string'));
if isnan(handles.L)
    errordlg('you must enter a numeric value','Error')
end

guidata(hObject,handles)

% --- Executes during object creation, after setting all properties.
function L_CreateFcn(hObject, eventdata, handles)
    % hObject    handle to L (see GCBO)
    % eventdata  reserved - to be defined in a future version of MATLAB
    % handles    empty - handles not created until after all CreateFcns called

% Hint: edit controls usually have a white background on Windows.
% See ISPC and COMPUTER.
if ispc && isequal(get(hObject,'BackgroundColor'),get(0,'defaultUicontrolBackgroundColor'))
    set(hObject,'BackgroundColor','white');
end

% --- Executes on button press in togglebutton35.
function togglebutton35_Callback(hObject, eventdata, handles)
    % hObject    handle to togglebutton35 (see GCBO)
    % eventdata  reserved - to be defined in a future version of MATLAB
    % handles    structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of togglebutton35

function ohm_Callback(hObject, eventdata, handles)
    % hObject    handle to ohm (see GCBO)
    % eventdata  reserved - to be defined in a future version of MATLAB
    % handles    structure with handles and user data (see GUIDATA)

% Hints: get(hObject,'String') returns contents of ohm as text
% str2double(get(hObject,'String')) returns contents of ohm as a double

handles.ohm=str2double(get(hObject,'string'));
if isnan(handles.ohm)
    errordlg('you must enter a numeric value','Error')
end

guidata(hObject,handles)

% --- Executes during object creation, after setting all properties.
function ohm_CreateFcn(hObject, eventdata, handles)
    % hObject    handle to ohm (see GCBO)
    % eventdata  reserved - to be defined in a future version of MATLAB
    % handles    empty - handles not created until after all CreateFcns called

% Hint: edit controls usually have a white background on Windows.
% See ISPC and COMPUTER.
if ispc && isequal(get(hObject, 'BackgroundColor'), get(0, 'defaultUicontrolBackgroundColor'))
   set(hObject, 'BackgroundColor', 'white');
end

% --- Executes on button press in togglebutton36.
function togglebutton36_Callback(hObject, eventdata, handles)
    % hObject    handle to togglebutton36 (see GCBO)
    % eventdata  reserved - to be defined in a future version of MATLAB
    % handles    structure with handles and user data (see GUIDATA)

    % Hint: get(hObject,'Value') returns toggle state of togglebutton36

function Kr_Callback(hObject, eventdata, handles)
    % hObject    handle to Kr (see GCBO)
    % eventdata  reserved - to be defined in a future version of MATLAB
    % handles    structure with handles and user data (see GUIDATA)

    % Hints: get(hObject,'String') returns contents of Kr as text
    %        str2double(get(hObject,'String')) returns contents of Kr as a double
    handles.Kr=str2double(get(hObject,'string'));
    if isnan(handles.Kr)
        errordlg('you must enter a numeric value','Error')
    end
    guidata(hObject,handles)

% --- Executes during object creation, after setting all properties.
function Kr_CreateFcn(hObject, eventdata, handles)
    % hObject    handle to Kr (see GCBO)
    % eventdata  reserved - to be defined in a future version of MATLAB
    % handles    empty - handles not created until after all CreateFcns called

    % Hint: edit controls usually have a white background on Windows.
    % See ISPC and COMPUTER.
    if ispc && isequal(get(hObject, 'BackgroundColor'), get(0, 'defaultUicontrolBackgroundColor'))
       set(hObject, 'BackgroundColor', 'white');
    end

% --- Executes on button press in togglebutton37.
function togglebutton37_Callback(hObject, eventdata, handles)
    % hObject    handle to togglebutton37 (see GCBO)
    % eventdata  reserved - to be defined in a future version of MATLAB
    % handles    structure with handles and user data (see GUIDATA)

    % Hint: get(hObject,'Value') returns toggle state of togglebutton37

function ALF_Callback(hObject, eventdata, handles)
    % hObject    handle to ALF (see GCBO)
    % eventdata  reserved - to be defined in a future version of MATLAB
    % handles    structure with handles and user data (see GUIDATA)

    % Hints: get(hObject,'String') returns contents of ALF as text
    %        str2double(get(hObject,'String')) returns contents of ALF as a double

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handles.ALF=str2double(get(hObject,'string'));
if isnan(handles.ALF)
    errordlg('you must enter a numeric value','Error')
end
guidata(hObject,handles)

% --- Executes during object creation, after setting all properties.
function ALF_CreateFcn(hObject, eventdata, handles)
% hObject    handle to ALF (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    empty - handles not created until after all CreateFcns called

% Hint: edit controls usually have a white background on Windows.
% See ISPC and COMPUTER.
if ispc && isequal(get(hObject,'BackgroundColor'),
get(0,'defaultUicontrolBackgroundColor'))
    set(hObject,'BackgroundColor','white');
end

% --- Executes on button press in pushbutton4.
function pushbutton4_Callback(hObject, eventdata, handles)
% hObject    handle to pushbutton4 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% --- Executes on button press in Zs.
function Zs_Callback(hObject, eventdata, handles)
% hObject    handle to Zs (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of Zs

% --- Executes on button press in pushbutton5.
function pushbutton5_Callback(hObject, eventdata, handles)
% hObject    handle to pushbutton5 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% --- Executes on button press in Zbs.
function Zbs_Callback(hObject, eventdata, handles)
% hObject    handle to Zbs (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of Zbs

% --- Executes on button press in pushbutton6.
function pushbutton6_Callback(hObject, eventdata, handles)
% hObject    handle to pushbutton6 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% --- Executes on button press in Rs.
function Rs_Callback(hObject, eventdata, handles)
% hObject    handle to Rs (see GCBO)
% eventdata reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of Rs

% --- Executes on button press in pushbutton7.
function pushbutton7_Callback(hObject, eventdata, handles)
    % hObject    handle to pushbutton7 (see GCBO)
    % eventdata reserved - to be defined in a future version of MATLAB
    % handles    structure with handles and user data (see GUIDATA)

% --- Executes on button press in Xs.
function Xs_Callback(hObject, eventdata, handles)
    % hObject    handle to Xs (see GCBO)
    % eventdata reserved - to be defined in a future version of MATLAB
    % handles    structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of Xs

% --- Executes on button press in pushbutton8.
function pushbutton8_Callback(hObject, eventdata, handles)
    % hObject    handle to pushbutton8 (see GCBO)
    % eventdata reserved - to be defined in a future version of MATLAB
    % handles    structure with handles and user data (see GUIDATA)

% --- Executes on button press in T1.
function T1_Callback(hObject, eventdata, handles)
    % hObject    handle to T1 (see GCBO)
    % eventdata reserved - to be defined in a future version of MATLAB
    % handles    structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of T1

% --- Executes on button press in pushbutton9.
function pushbutton9_Callback(hObject, eventdata, handles)
    % hObject    handle to pushbutton9 (see GCBO)
    % eventdata reserved - to be defined in a future version of MATLAB
    % handles    structure with handles and user data (see GUIDATA)

% --- Executes on button press in Zbl.
function Zbl_Callback(hObject, eventdata, handles)
    % hObject    handle to Zbl (see GCBO)
    % eventdata reserved - to be defined in a future version of MATLAB
    % handles    structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of Zbl

% --- Executes on button press in pushbutton10.
function pushbutton10_Callback(hObject, eventdata, handles)
    % hObject    handle to pushbutton10 (see GCBO)
    % eventdata reserved - to be defined in a future version of MATLAB
    % handles    structure with handles and user data (see GUIDATA)

% --- Executes on button press in Rl.
function Rl_Callback(hObject, eventdata, handles)
% hObject    handle to Rl (see GCBO)
% eventdata reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of Rl

% --- Executes on button press in pushbutton11.
function pushbutton11_Callback(hObject, eventdata, handles)
% hObject    handle to pushbutton11 (see GCBO)
% eventdata reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% --- Executes on button press in Xl.
function Xl_Callback(hObject, eventdata, handles)
% hObject    handle to Xl (see GCBO)
% eventdata reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of Xl

% --- Executes on button press in pushbutton12.
function pushbutton12_Callback(hObject, eventdata, handles)
% hObject    handle to pushbutton12 (see GCBO)
% eventdata reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% --- Executes on button press in togglebutton46.
function togglebutton46_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton46 (see GCBO)
% eventdata reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of togglebutton46

% --- Executes on button press in pushbutton13.
function pushbutton13_Callback(hObject, eventdata, handles)
% hObject    handle to pushbutton13 (see GCBO)
% eventdata reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% --- Executes on button press in ZT.
function ZT_Callback(hObject, eventdata, handles)
% hObject    handle to ZT (see GCBO)
% eventdata reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of ZT

% --- Executes on button press in pushbutton14.
function pushbutton14_Callback(hObject, eventdata, handles)
% hObject    handle to pushbutton14 (see GCBO)
% eventdata reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% --- Executes on button press in Ktf.
function Ktf_Callback(hObject, eventdata, handles)
% hObject    handle to Ktf (see GCBO)
% eventdata reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of Ktf

% --- Executes on button press in pushbutton15.
function pushbutton15_Callback(hObject, eventdata, handles)
    % hObject    handle to pushbutton15 (see GCBO)
    % eventdata  reserved - to be defined in a future version of MATLAB
    % handles    structure with handles and user data (see GUIDATA)

% --- Executes on button press in Krem.
function Krem_Callback(hObject, eventdata, handles)
    % hObject    handle to Krem (see GCBO)
    % eventdata  reserved - to be defined in a future version of MATLAB
    % handles    structure with handles and user data (see GUIDATA)

% --- Executes on button press in pushbutton16.
function pushbutton16_Callback(hObject, eventdata, handles)
    % hObject    handle to pushbutton16 (see GCBO)
    % eventdata  reserved - to be defined in a future version of MATLAB
    % handles    structure with handles and user data (see GUIDATA)

% --- Executes on button press in Rct2.
function Rct2_Callback(hObject, eventdata, handles)
    % hObject    handle to Rct2 (see GCBO)
    % eventdata  reserved - to be defined in a future version of MATLAB
    % handles    structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of Rct2

handles.Rct2=str2double(get(hObject,'string'));
if isnan(handles.Rct2)
    errordlg('you must enter a numeric value','Error')
end
guidata(hObject,handles)

function Ip1_Callback(hObject, eventdata, handles)
    % hObject    handle to Ip1 (see GCBO)
    % eventdata  reserved - to be defined in a future version of MATLAB
    % handles    structure with handles and user data (see GUIDATA)

% Hints: get(hObject,'String') returns contents of Ip1 as text
%        str2double(get(hObject,'String')) returns contents of Ip1 as a double

handles.Ip1=str2double(get(hObject,'string'));
if isnan(handles.Ip1)
    errordlg('you must enter a numeric value','Error')
end
guidata(hObject,handles)

% --- Executes during object creation, after setting all properties.
function Ip1_CreateFcn(hObject, eventdata, handles)
    % hObject    handle to Ip1 (see GCBO)
    % eventdata  reserved - to be defined in a future version of MATLAB
    % handles    structure with handles and user data (see GUIDATA)
% handles empty - handles not created until after all CreateFcns called

% Hint: edit controls usually have a white background on Windows. See ISPC and COMPUTER.
if ispc && isequal(get(hObject,'BackgroundColor'),
    get(0,'defaultUicontrolBackgroundColor'))
    set(hObject,'BackgroundColor','white');
end
% --- Executes on button press in Vm.
function Vm_Callback(hObject, eventdata, handles)
    % hObject    handle to Vm (see GCBO)
    % eventdata  reserved - to be defined in a future version of MATLAB
    % handles    structure with handles and user data (see GUIDATA)
    % Hint: get(hObject,'Value') returns toggle state of Vm
    handles.Vm=str2double(get(hObject,'string'));
    if isnan(handles.Vm)
        errordlg('you must enter a numeric value','Error')
    end
    guidata(hObject,handles)
function Io_Callback(hObject, eventdata, handles)
    % hObject    handle to Io (see GCBO)
    % eventdata  reserved - to be defined in a future version of MATLAB
    % handles    structure with handles and user data (see GUIDATA)
    % Hints: get(hObject,'String') returns contents of Io as text
    %        str2double(get(hObject,'String')) returns contents of Io as a double
    handles.Io=str2double(get(hObject,'string'));
    if isnan(handles.Io)
        errordlg('you must enter a numeric value','Error')
    end
    guidata(hObject,handles)

% --- Executes during object creation, after setting all properties.
function Io_CreateFcn(hObject, eventdata, handles)
    % hObject    handle to Io (see GCBO)
    % eventdata  reserved - to be defined in a future version of MATLAB
    % handles    empty - handles not created until after all CreateFcns called

    % Hint: edit controls usually have a white background on Windows. See ISPC and COMPUTER.
    if ispc && isequal(get(hObject,'BackgroundColor'),
        get(0,'defaultUicontrolBackgroundColor'))
        set(hObject,'BackgroundColor','white');
    end

% --- Executes on button press in pushbutton17.
function pushbutton17_Callback(hObject, eventdata, handles)
    % hObject    handle to pushbutton17 (see GCBO)
    % eventdata  reserved - to be defined in a future version of MATLAB
    % handles    structure with handles and user data (see GUIDATA)
function MVA_Callback(hObject, eventdata, handles)
% hObject    handle to MVA (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)
% Hints: get(hObject,'String') returns contents of MVA as text
%        str2double(get(hObject,'String')) returns contents of MVA as a double

handles.MVA=str2double(get(hObject,'String'));
if isnan(handles.MVA)
    errordlg('you must enter a numeric value','Error')
end
guidata(hObject,handles)

% --- Executes during object creation, after setting all properties.
function MVA_CreateFcn(hObject, eventdata, handles)
% hObject    handle to MVA (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    empty - handles not created until after all CreateFcns called
% Hint: edit controls usually have a white background on Windows.
%        See ISPC and COMPUTER.
if ispc && isequal(get(hObject,'BackgroundColor'),
    get(0,'defaultUicontrolBackgroundColor'))
    set(hObject,'BackgroundColor','white');
end

% --- Executes on button press in togglebutton52.
function togglebutton52_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton52 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of togglebutton52

% --- Executes on button press in togglebutton53.
function togglebutton53_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton53 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of togglebutton53

% --- Executes on button press in togglebutton54.
function togglebutton54_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton54 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of togglebutton54

% --- Executes on button press in togglebutton55.
function togglebutton55_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton55 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)
% Hint: get(hObject,'Value') returns toggle state of togglebutton55

function edit19_Callback(hObject, eventdata, handles)
% hObject handle to edit19 (see GCBO)
% eventdata reserved - to be defined in a future version of MATLAB
% handles structure with handles and user data (see GUIDATA)

% Hints: get(hObject,'String') returns contents of edit19 as text
%        str2double(get(hObject,'String')) returns contents of edit19 as a double

% --- Executes during object creation, after setting all properties.
function edit19_CreateFcn(hObject, eventdata, handles)
% hObject handle to edit19 (see GCBO)
% eventdata reserved - to be defined in a future version of MATLAB
% handles empty - handles not created until after all CreateFcns called

% Hint: edit controls usually have a white background on Windows.
%       See ISPC and COMPUTER.
if ispc && isequal(get(hObject,'BackgroundColor'),
    get(0,'defaultUicontrolBackgroundColor'))
    set(hObject,'BackgroundColor','white');
end

% --- Executes on button press in RL.
function RL_Callback(hObject, eventdata, handles)
% hObject handle to RL (see GCBO)
% eventdata reserved - to be defined in a future version of MATLAB
% handles structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of RL

function ALF20_Callback(hObject, eventdata, handles)
% hObject handle to ALF20 (see GCBO)
% eventdata reserved - to be defined in a future version of MATLAB
% handles structure with handles and user data (see GUIDATA)

% Hints: get(hObject,'String') returns contents of ALF20 as text
%        str2double(get(hObject,'String')) returns contents of ALF20 as a double

handles.ALF20=str2double(get(hObject,'string'));
if isnan(handles.ALF20)
    errordlg('you must enter a numeric value','Error')
end
guidata(hObject,handles)

% --- Executes during object creation, after setting all properties.
function ALF20_CreateFcn(hObject, eventdata, handles)
% hObject handle to ALF20 (see GCBO)
% eventdata reserved - to be defined in a future version of MATLAB
% handles empty - handles not created until after all CreateFcns called

% Hint: edit controls usually have a white background on Windows.
%       See ISPC and COMPUTER.
if ispc && isequal(get(hObject,'BackgroundColor'),
get(0,'defaultUicontrolBackgroundColor'))
    set(hObject,'BackgroundColor','white');
end

function Vknee20_Callback(hObject, eventdata, handles)
    % hObject    handle to Vknee20 (see GCBO)
    % eventdata  reserved - to be defined in a future version of MATLAB
    % handles    structure with handles and user data (see GUIDATA)

    % Hints: get(hObject,'String') returns contents of Vknee20 as text
    %        str2double(get(hObject,'String')) returns contents of Vknee20
    %        as a double
    handles.Vknee20=str2double(get(hObject,'string'));
    if isnan(handles.Vknee20)
        errordlg('you must enter a numeric value','Error');
    end
    guidata(hObject,handles)

% --- Executes during object creation, after setting all properties.
function Vknee20_CreateFcn(hObject, eventdata, handles)
    % hObject    handle to Vknee20 (see GCBO)
    % eventdata  reserved - to be defined in a future version of MATLAB
    % handles    empty - handles not created until after all CreateFcns
    %        called

    % Hint: edit controls usually have a white background on Windows.
    %        See ISPC and COMPUTER.
    if ispc && isequal(get(hObject,'BackgroundColor'),
    get(0,'defaultUicontrolBackgroundColor'))
        set(hObject,'BackgroundColor','white');
    end

function VA20_Callback(hObject, eventdata, handles)
    % hObject    handle to VA20 (see GCBO)
    % eventdata  reserved - to be defined in a future version of MATLAB
    % handles    structure with handles and user data (see GUIDATA)

    % Hints: get(hObject,'String') returns contents of VA20 as text
    %        str2double(get(hObject,'String')) returns contents of VA20 as a
    %        double
    handles.VA20=str2double(get(hObject,'string'));
    if isnan(handles.VA20)
        errordlg('you must enter a numeric value','Error');
    end
    guidata(hObject,handles)

% --- Executes during object creation, after setting all properties.
function VA20_CreateFcn(hObject, eventdata, handles)
    % hObject    handle to VA20 (see GCBO)
    % eventdata  reserved - to be defined in a future version of MATLAB
    % handles    empty - handles not created until after all CreateFcns
    %        called

    % Hint: edit controls usually have a white background on Windows.
    %        See ISPC and COMPUTER.
if ispc && isequal(get(hObject,'BackgroundColor'),
    get(0,'defaultUicontrolBackgroundColor'))
    set(hObject,'BackgroundColor','white');
end

% --- Executes on button press in togglebutton65.
function togglebutton65_Callback(hObject, eventdata, handles)
    % hObject    handle to togglebutton65 (see GCBO)
    % eventdata  reserved
    % handles    structure with handles and user data (see GUIDATA)

    % Hint: get(hObject,'Value') returns toggle state of togglebutton65

% --- Executes on button press in togglebutton66.
function togglebutton66_Callback(hObject, eventdata, handles)
    % hObject    handle to togglebutton66 (see GCBO)
    % eventdata  reserved
    % handles    structure with handles and user data (see GUIDATA)

    % Hint: get(hObject,'Value') returns toggle state of togglebutton66

% --- Executes on button press in togglebutton67.
function togglebutton67_Callback(hObject, eventdata, handles)
    % hObject    handle to togglebutton67 (see GCBO)
    % eventdata  reserved
    % handles    structure with handles and user data (see GUIDATA)

    % Hint: get(hObject,'Value') returns toggle state of togglebutton67

% --- Executes on button press in togglebutton68.
function togglebutton68_Callback(hObject, eventdata, handles)
    % hObject    handle to togglebutton68 (see GCBO)
    % eventdata  reserved
    % handles    structure with handles and user data (see GUIDATA)

    % Hint: get(hObject,'Value') returns toggle state of togglebutton68

% --- Executes on button press in togglebutton69.
function togglebutton69_Callback(hObject, eventdata, handles)
    % hObject    handle to togglebutton69 (see GCBO)
    % eventdata  reserved
    % handles    structure with handles and user data (see GUIDATA)

    % Hint: get(hObject,'Value') returns toggle state of togglebutton69

% --- Executes on button press in togglebutton70.
function togglebutton70_Callback(hObject, eventdata, handles)
    % hObject    handle to togglebutton70 (see GCBO)
    % eventdata  reserved
    % handles    structure with handles and user data (see GUIDATA)

    % Hint: get(hObject,'Value') returns toggle state of togglebutton70

% --- Executes on button press in togglebutton71.
function togglebutton71_Callback(hObject, eventdata, handles)
    % hObject    handle to togglebutton71 (see GCBO)
    % eventdata  reserved
    % handles    structure with handles and user data (see GUIDATA)
function togglebutton72_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton72 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of togglebutton72
% --- Executes on button press in togglebutton72.

function togglebutton73_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton73 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of togglebutton73
% --- Executes on button press in togglebutton73.

function togglebutton74_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton74 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of togglebutton74
% --- Executes on button press in togglebutton74.

function togglebutton75_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton75 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of togglebutton75
% --- Executes on button press in togglebutton75.

function togglebutton76_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton76 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of togglebutton76
% --- Executes on button press in togglebutton76.

function togglebutton77_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton77 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of togglebutton77
% --- Executes on button press in togglebutton77.

function togglebutton78_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton78 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of togglebutton78
% --- Executes on button press in togglebutton78.
% Hint: get(hObject,'Value') returns toggle state of togglebutton78

% --- Executes on button press in togglebutton79.
function togglebutton79_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton79 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of togglebutton79
% --- Executes on button press in togglebutton80.
function togglebutton80_Callback(hObject, eventdata, handles)
% hObject    handle to Togglebutton80 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of togglebutton80
% --- Executes on button press in togglebutton81.
function togglebutton81_Callback(hObject, eventdata, handles)
% hObject    handle to Togglebutton81 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of togglebutton81
% --- Executes on button press in togglebutton82.
function togglebutton82_Callback(hObject, eventdata, handles)
% hObject    handle to Togglebutton82 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of togglebutton82
% --- Executes on button press in togglebutton83.
function togglebutton83_Callback(hObject, eventdata, handles)
% hObject    handle to Togglebutton83 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of togglebutton83
% --- Executes on button press in togglebutton84.
function togglebutton84_Callback(hObject, eventdata, handles)
% hObject    handle to Togglebutton84 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of togglebutton84
% --- Executes on button press in togglebutton91.
function togglebutton91_Callback(hObject, eventdata, handles)
% hObject    handle to Togglebutton91 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hint: get(hObject,'Value') returns toggle state of togglebutton91
% --- Executes on button press in togglebutton92.
function togglebutton92_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton92 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)
% Hint: get(hObject,'Value') returns toggle state of togglebutton92

% --- Executes on button press in togglebutton93.
function togglebutton93_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton93 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)
% Hint: get(hObject,'Value') returns toggle state of togglebutton93

% --- Executes on button press in togglebutton94.
function togglebutton94_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton94 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)
% Hint: get(hObject,'Value') returns toggle state of togglebutton94

% --- Executes on button press in togglebutton95.
function togglebutton95_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton95 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)
% Hint: get(hObject,'Value') returns toggle state of togglebutton95

% --- Executes on button press in togglebutton96.
function togglebutton96_Callback(hObject, eventdata, handles)
% hObject    handle to togglebutton96 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)
% Hint: get(hObject,'Value') returns toggle state of togglebutton96

% --- Executes on button press in pushbutton18.
function pushbutton18_Callback(hObject, eventdata, handles)
% hObject    handle to pushbutton18 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)
SUM

% --- Executes on button press in pushbutton19.
function pushbutton19_Callback(hObject, eventdata, handles)
% hObject    handle to pushbutton19 (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

x1=[0.0010 0.0020 0.0040 0.0050 0.0080 0.0100 0.0200 0.0400 0.0500
0.0800 0.1000 0.2000 0.4000 0.5000 0.8000 1.000]
y1=[39.3 77.5 204.0 287.0 507.8 622.9 797.0 859.6 870.1 887.8 895.6
919.4 943.8 951.1 965.4 972.7]
\[
y_2 = [38.8 \ 82.1 \ 222.3 \ 306.7 \ 539.0 \ 683.3 \ 851.0 \ 885.2 \ 893.8 \ 909.2 \ 916.3 \\
939.2 \ 962.9 \ 970.4 \ 984.9 \ 991.2]
\]
\[
y_3 = [30.3 \ 72.7 \ 226.7 \ 317.5 \ 549.8 \ 674.2 \ 851.8 \ 886.9 \ 895.3 \ 910.7 \ 917.8 \\
940.5 \ 963.6 \ 967.5 \ 982.4 \ 989.6]
\]
\[
y_4 = [38.2 \ 83.3 \ 232.9 \ 302.0 \ 546.7 \ 670.4 \ 834.5 \ 877.0 \ 885.9 \ 902.4 \ 910.4 \\
934.7 \ 960.3 \ 967.5 \ 982.4 \ 989.6]
\]
\[
y_5 = [36.3 \ 81.6 \ 214.2 \ 297.3 \ 534.4 \ 661.6 \ 848.4 \ 888.8 \ 897.0 \ 911.6 \ 919.0 \\
942.4 \ 966.7 \ 974.2 \ 989.0 \ 995.7]
\]
\[
y_6 = [34.9 \ 86.5 \ 223.8 \ 308.4 \ 552.9 \ 679.8 \ 847.2 \ 883.0 \ 890.8 \ 905.6 \ 912.9 \\
935.4 \ 959.5 \ 966.4 \ 981.2 \ 987.4]
\]

```matlab
figure
axes('FontSize',12)
loglog(x1,y1,'-ro','LineWidth',1.0,'MarkerEdgeColor','r','MarkerFaceColor','g','MarkerSize',2)
hold on
loglog(x1,y2,'-yo','LineWidth',1.0,'MarkerEdgeColor','r','MarkerFaceColor','r','MarkerSize',2)
hold on
loglog(x1,y3,'-bo','LineWidth',1.0,'MarkerEdgeColor','r','MarkerFaceColor','w','MarkerSize',2)
hold on
loglog(x1,y4,'-ro','LineWidth',1.0,'MarkerEdgeColor','r','MarkerFaceColor','c','MarkerSize',2)
hold on
loglog(x1,y5,'-yo','LineWidth',1.0,'MarkerEdgeColor','r','MarkerFaceColor','m','MarkerSize',2)
hold on
loglog(x1,y6,'-bo','LineWidth',1.0,'MarkerEdgeColor','r','MarkerFaceColor','g','MarkerSize',2)
hold on
hold off
h = legend('CT4-Red Phase','CT4-Yellow Phase','CT4-Blue Phase','CT5-Red Phase','CT5-Yellow Phase','CT5-Blue Phase');
grid on
xlabel({'Current in mA';'Current'})
ylabel({'Voltage in V';'Voltage'})
title('CT SATURATION PLOT','fontsize',15,'fontweight','b');
text(0.01,18,'ASA 10/50Vkp:CT4 R = 716.5 V; CT4 Y = 753.1V: CT4 B = 757.0V','FontSize',12,'fontweight','b')
text(0.01,15,'Vkp = 295.7V;291.25V;288.45V','FontSize',12,'fontweight','b')
text(0.01,13,'ASA 10/50Vkp:CT5 R = 743.7 V; CT5 Y = 750.8V: CT5 B = 748.3V','FontSize',12,'fontweight','b')
text(0.01,11,'Vkp = 295.7V;291.25V;288.45V','FontSize',12,'fontweight','b')
```