%MATLAB script that perform the Newton Raphson iterations for the second

%question of the first exam (first semester 2017/2018)

%%%%%%%% Definition of the Ybus matrix %%%%%%%%%%%%%%%%%%%

Y11 = 2.8-9.6j;

Y12 = -2.8+9.6j;

Y21 = Y12;

Y22 = 2.8-9.6j;

theta21 = angle(Y21);

theta22 = angle(Y22);

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%%%%%%%% Initial conditions of voltages %%%%%%%%%%%%%%%%%

V1 = 1; % Slack bus

V2 = 1; % PQ bus

P2actual = -1.5; Q2actual = -.5;

factual = [P2actual;Q2actual];

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x = [0; 1];

%%%%%%%% Calculation of Newton-Raphson interations %%%%%%%%%%%%%

for i=1:99

 P2(i) = 10\*abs(V2(i))\*cos(angle(V2(i))-theta21)+10\*abs(V2(i))^2\*cos(-theta22);

 Q2(i) = 10\*abs(V2(i))\*sin(angle(V2(i))-theta21)+10\*abs(V2(i))^2\*sin(-theta22);

 f = [P2(i); Q2(i)];

 J1(i) = -10\*abs(V2(i))\*sin(angle(V2(i))-theta21);

 J2(i) = 10\*cos(angle(V2(i))-theta21)+20\*abs(V2(i))\*cos(-theta22);

 J3(i) = 10\*abs(V2(i))\*cos(angle(V2(i))-theta21);

 J4(i) = 10\*sin(angle(V2(i))-theta21)+20\*abs(V2(i))\*sin(-theta22);

 J = [J1(i) J2(i);J3(i) J4(i)];

 Jinv = inv(J);

 x(:,i+1) = x(:,i) + Jinv\*(factual-f);

 V2(i+1) = x(2,i+1)\*(cos(x(1,i+1))+j\*sin(x(1,i+1)));

end

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PFE1 = conj(V1)\*(Y11\*V1+Y12\*V2(i+1));

P1 = real(PFE1);

Q1 = -imag(PFE1);

figure, subplot(211), plot(abs(V2)), ylabel('|V\_2(k)|'),

 subplot(212), plot(angle(V2)\*180/pi),

 ylabel('\angleV\_2(k)^\circ'), xlabel('iteration number k')

fprintf('Iteration |V2| Angle of V2 \n')

bus\_info=[[0:99]' abs(V2)' angle(V2)'\*180/pi];

disp(bus\_info)

fprintf(' Bus number P Q \n')

bus\_info=[1 P1 Q1];

disp(bus\_info)