ECE 842 Power Flow Problem-Newton Raphson-1

Given

$$P_k + jQ_k = V_k e^{j\theta_k} \sum_{m=1}^{n} Y_{km} e^{-j\alpha_{km}} V_m e^{-j\theta_m}$$

Where

$$\theta_k = \tan^{-1}\frac{f_k}{e_k}\ ,\ \overset{"}{V_k} = e_k\ + jf_k\ \ ,\ V_m = e_m + jf_m$$

$$Y_{km} = Y_{km} e^{j\alpha_{km}} = G_{km} + jB_{km}$$

$$\alpha_{km} = \tan^{-1}\frac{B_{km}}{G_{km}}$$

<u>Show that for m≠k</u>

$$H_{km} = \frac{\partial P_k}{\partial \theta_m} = a_m f_k - b_m e_k$$

$$J_{km} = \frac{\partial Q_k}{\partial \theta_m} = -a_m e_k - b_m f_k$$

Where

$$a_m = G_{km} e_m - B_{km} f_m$$

$$b_m = B_{km} e_m - G_{km} f_m$$

ECE 842 Newton Raphson Method Problem 2

A five power system network is described below:

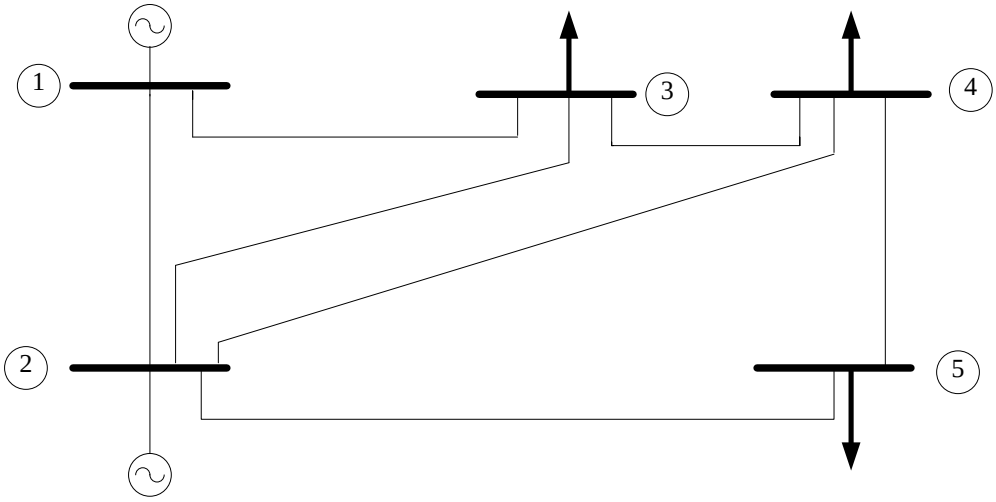

Table II (MVA Base =100 MVA)

BRANCH	BRANCH IMPEDANCE	SHUNT ADMITTANCE (B/2)
1-2	0.02 + j 0.06	0.0 + j 0.030
1-3	0.08 + j 0.24	0.0 + j 0.025
2-3	0.06 + j 0.18	0.0 + j 0.020
2-4	0.06 + j 0.18	0.0 + j 0.025
2-5	0.04 + j 0.12	0.0 + j 0.015
3-4	0.01 + j 0.03	0.0 + j 0.010
4-5	0.08 + j 0.24	0.0 + j 0.025

Table II

BUS NO.	*TYPE*	VOLTAGE	INJECTIONS AT T = 0
1	SWING	1.06	-
2	GEN	-	0.20 + j 0.20
3	LOAD	-	- 0.45 - j 0.45
4	LOAD	-	- 0.40 – j 0.05
5	LOAD	-	- 0.6 – j 0.10

Write Matlab Simulation testbed to compute bus voltages, active and reactive line flows. Assume tolerance on delta P and delta Q to be less than 0.00001 pu.

Write a report and analyze your results.