How To Perform Load Flow Analysis of IEEE 5-Bus System Using MATLAB

By:

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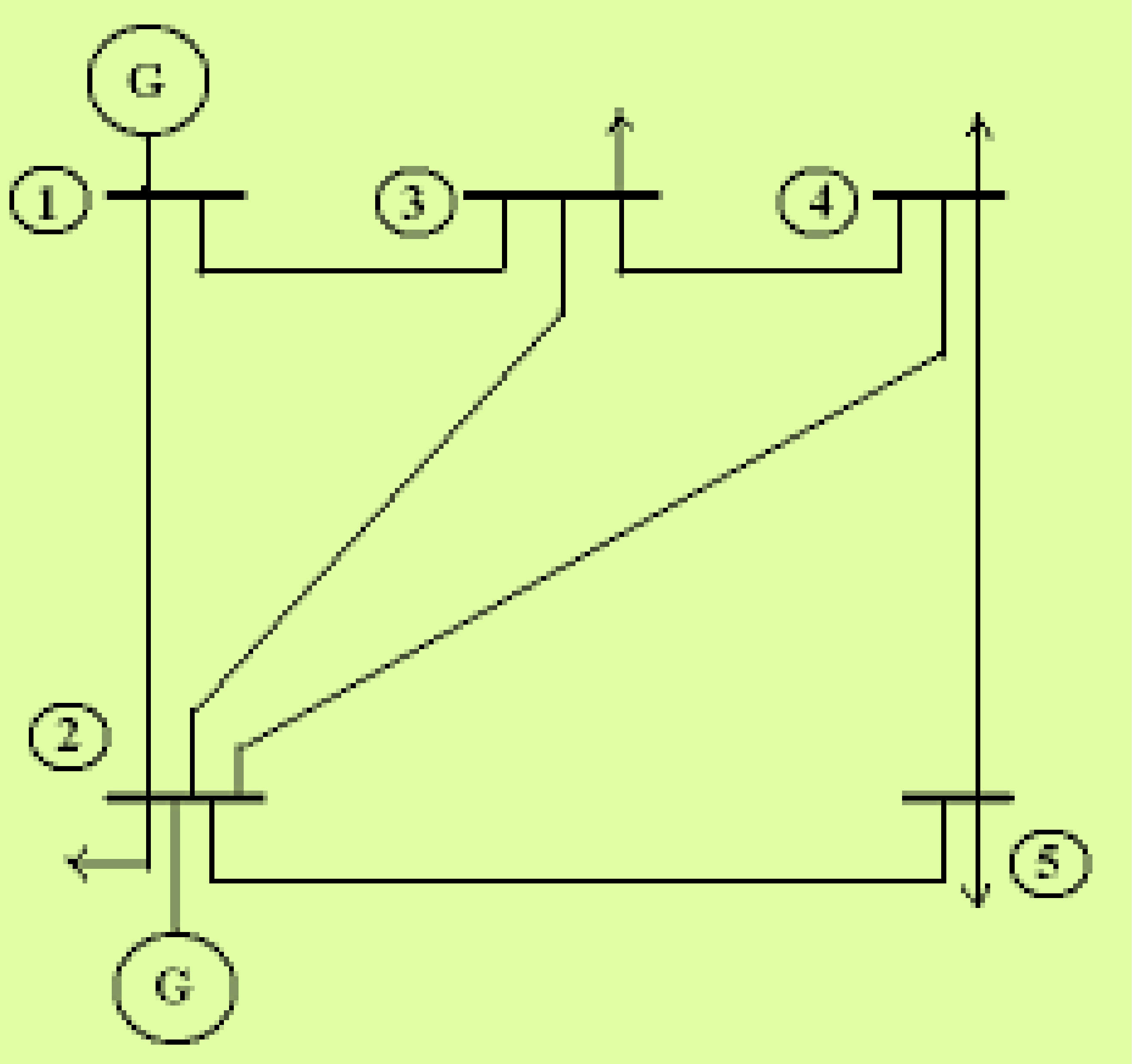
❖ Single Line Diagram of IEEE 5-Bus System



How To Save MATLAB Folder Of Power System Analysis Book By Hadi Sadat in MATLAB Using Set Path Feature

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Power System Modelling in MATLAB

❖ Bus Data for IEEE 5 Bus System

Bus No.	Bus Code	Voltage (P.U.)	Generation		Load	
			MW	Mvar	MW	Mvar
1	1 (Swing)	1.06 + j 0.0	0	0	0	0
2	0 (PQ)	1.00 + j 0.0	40	30	20	10
3	0 (PQ)	1.00 + j 0.0	0	0	45	15
4	0 (PQ)	1.00 + j 0.0	0	0	40	5
5	0 (PQ)	1.00 + j 0.0	0	0	60	10

❖ Line Data for IEEE 5 Bus System

Line From	Line To	Line Impedance		Line Charging Susceptance ½ B
		R (p.u.)	X (p.u.)	
1	2	0.02	0.06	0+j0.03
1	3	0.08	0.24	0+j0.025
2	3	0.06	0.18	0+j0.02
2	4	0.06	0.18	0+j0.02
2	5	0.04	0.12	0+j0.015
3	4	0.01	0.03	0+j0.01
4	5	0.08	0.24	0+j0.025

❖ Load Flow Solution of IEEE 5 Bus System

Bus No.	Generation		Load		Bus Voltage	
	MW	Mvar	MW	Mvar	Voltage(p.u.)	Angle
1	129.59	-7.42	0	0	1.06	0
2	40	30	20	10	1.0474	-2.8063
3	0	0	45	15	1.0242	-4.997
4	0	0	40	5	1.0236	-5.3291
5	0	0	60	10	1.0179	-6.1503

❖Solution:

❖ Power Flow Programs:

❖Several computer programs have been developed for the power flow solution of practical systems.

❖Each method of solution consists of four programs.

❖The program for the Gauss-Seidel method is lfgauss, which is preceded by lfybus, and is followed by busout, and lineflow.

❖Solution:

❖ Power Flow Programs:

❖The following is a brief description of the programs used in the Gauss-Seidel Method.

❖ lfybus MTLAB Function:

❖This program requires the line data and transformer parameters and transformer tap settings specified in the input file named *linedata*.

❖It converts impedances to admittances and obtains the bus admittance matrix.

❖Solution:

❖ Power Flow Programs:

❖ lfgauss MTLAB Function:

❖This program obtains the power flow solution by the Gauss-Seidel method and requires the files named *busdata* and *linedata*.

❖It is designed for the direct use of load and generation in MW and Mvar, bus voltages in per unit, and angle in degrees.

❖Loads and generation are converted to per unit quantities on the base MVA selected.

❖Solution:

❖ Power Flow Programs:

❖ *busout* MTLAB Function:

❖This program produces the bus output result in a tabulated form.

❖The bus output result includes the voltage magnitude and angle, real and reactive power of generators and loads and the shunt capacitor/reactor Mvar.

❖Total generation and total load are also included as outlined in the example case.

❖ Solution:

❖ Power Flow Programs:

❖ *lineflow* MTLAB Function:

❖ This program prepares the line output data.

❖ It is designed to display the active and reactive power flow entering the line terminals and line losses as well as the net power at each bus.

❖ The total real and reactive losses in the system are also included. The output of this portion is also shown in the sample case.

❖Solution:

❖ Newton Raphson Power Flow Programs:

❖ Data Preparation:

❖In order to perform a power flow analysis by the Gauss-seidel method in the MATLAB environment, the following variables must be defined:

❖Power system base MVA, Power mismatch accuracy,
❖Acceleration factor, and Maximum number of iterations.

❖The name (in lowercase letters) reserved for these variables are basemava, accuracy, accel, and maxiter iteratively. Typical values are as follows:

❖basemava=100; accuracy = 0.001;
❖accel = 1.8; maxiter = 80

❖The initial step in the preparation of input file is the numbering of each bus.

❖Solution:

❖ Newton Raphson Power Flow Programs:

❖In addition, the following data files are required.

❖ Bus Data File – busdata:

❖The format for the bus is shown to facilitate the required data for each case in a single row. The information required must be included in a matrix called *busdata*.

❖Column 1 is the bus number.
❖Column 2 contains the bus code.
❖Column 3 and 4 are voltage magnitude in per unit and phase angles in degrees.
❖Column 5 and 6 are load MW and Mvar.
❖Column 7 through 10 are MW and Mvar, minimum Mvar and maximum Mvar of generation in that order. The last column is the injected Mvar of shunt capactiors.

❖ Solution:

❖ Newton Raphson Power Flow Programs:

❖ Bus Data File – busdata:

❖ The bus code entered in column 2 is used for identifying load, voltage controlled and slack buses as outlined below:

❖ 1 = This code is used for slack bus. The only necessary information for this bus is the voltage magnitude and its phase angle.

❖ 0 = This code is used for load buses. The loads are entered positive in MW & Mvars.

❖ 2 = This code is used for the voltage controlled buses. For this bus, voltage magnitude, real power generation in megawatts, and the minimum and maximum limits of the megavar demand must be specified.

❖Solution:

❖ Newton Raphson Power Flow Programs:

❖ Line Data File – linedata:

❖Lines are identified by the node-pair method. The information required must be incuded in a matrix called linedata.

❖Columns 1 and 2 are the line bus numbers.
❖Column 3 through 5 contains the line resistance, reactance and one half of the total line charging susceptance in per unit on the specified MVA base.

❖The last column is for the transformer tap setting for lines, 1 must be entered in this column.

THANK YOU VERY MUCH