POWER ENGINEERING LAB

REPORT FOR POWER FLOW SOLUTION METHODS

EXPERIMENTS:

2. Gauss Sidel Method & 3. Newton Raphson Method

Indhu Kanth. L AAA0538 B.Tech EE Matlab codes for both Gauss Sidel and Newton Raphson methods were written based on Hadi Saadat's Power System Analysis and from the flow charts given below.

Both the program methods gives:

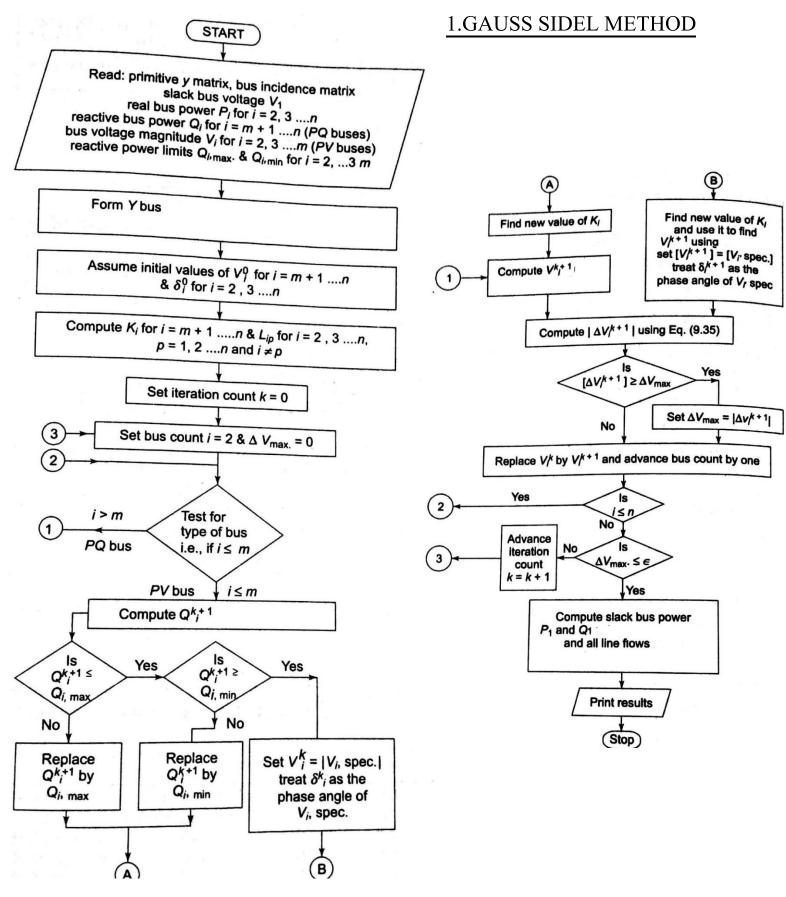
- 1) Y Bus Matrix
- 2) Line Flow
- 3) Line Losses

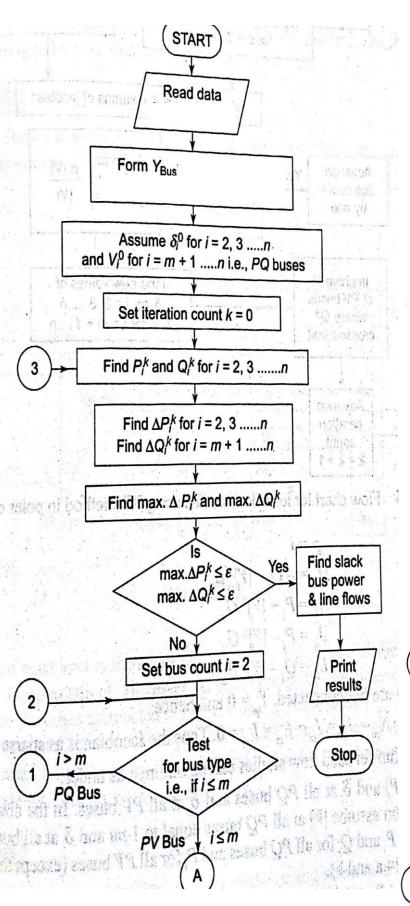
This code is devoid of:

- -Tap changing tansformer effects
- -Charging of shunt capacitors
- -Constraints

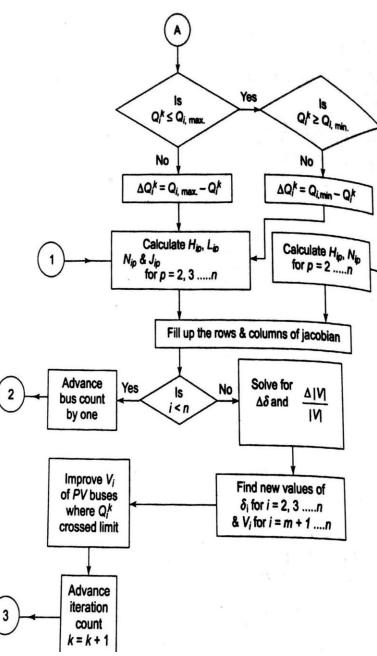
It is assured that all these negligence's will be taken care of and the code will be improved and rewritten soon.

FLOW CHARTS:





2.NEWTON RAPHSON METHOD



OUTPUT SCREENSHOTS



h	noose y	our option	1:2								Power Flo	w Solution -	- Newton-Ra	phson Metho	d
			Power Flo	w Solution	- Gauss-Seid	del Method						4 Iterati	ions		
				30 Itera	tions										
									Bus	Voltage	Angle	Load	d	Generat	ion
	Bus	Voltage	Angle	Loa		Generat			No.	Mag.	Degree	MW	Mvar	MW	Mvar
	No.	Mag.	Degree	MW	Mvar	MW	Mvar								
								1	1	1.025	0.000	51.000	41.000	719.358	192.079
1	1	1.025	0.000	51.000	41.000	719.340	192.081	1	2	1.020	-0.934	22.000	15.000	79.000	-112.254
1	2	1.020	-0.934	22.000	15.000			1	3	1.025	-4.374	64.000	50.000	20.000	146.534
1	3	1.025	-4.374	64.000	50.000	20.000	146.534	1	4	1.050	-4.008	25.000	10.000	100.000	292.529
1	4	1.050	-4.008	25.000	10.000	100.000	292.528	1	5	1.045	1.171	50.000	30.000	300.000	92.527
1	5	1.045	1.171	50.000	30.000	300.000	92.526	1	6	1.010	-2.630	76.000	29.000	0.000	0.000
1	6	1.010	-2.630	76.000	29.000	0.000	0.000	1	7 1	1.016	-3.456	0.000	0.000	0.000	0.000
1	7	1.016	-3.455	0.000	0.000	0.000	0.000		8	1.021	-3.609	0.000	0.000	0.000	0.000
1	8	1.021	-3.609	0.000	0.000	0.000	0.000	i	9	0.998	-5.677	89.000	50.000	0.000	0.000
1	9	0.998	-5.677	89.000	50.000	0.000	0.000	1	10	1.002	-5.782	0.000	0.000	0.000 1	0.000
1	10	1.002	-5.782	0.000	0.000	0.000	0.000	i i	11 i	1.002	-3.258 I	25.000	15.000 I	0.000	0.000
1	11	1.002	-3.258	25.000	15.000	0.000	0.000		12	1.017	-5.004	89.000	48.000 I	0.000	0.000
1	12	1.017	-5.004	89.000	48.000	0.000	0.000		13	1.020	-4.576	31.000	15.000 I	0.000	0.000
1	13	1.020	-4.576	31.000	15.000	0.000	0.000		14	1.012	-5.187	24.000	12.000	0.000	0.000
1	14	1.012	-5.187	24.000	12.000	0.000	0.000		15	1.004	-5.697	70.000	31.000	0.000	0.000
1	15	1.004	-5.697	70.000	31.000	0.000	0.000		16	0.993	-6.022	55.000	27.000	0.000	0.000
1	16	0.993	-6.022	55.000	27.000	0.000	0.000		17	0.994	-4.949	78.000	38.000	0.000	0.000
1	17	0.994	-4.949	78.000	38.000	0.000	0.000		18	1.011	-1.876 I	153.000	67.000	0.000	0.000
1	18	1.011	-1.876	153.000	67.000	0.000	0.000		19	0.986	-6.434	75.000	15.000	0.000 [0.000
1	19	0.986	-6.434	75.000	15.000	0.000	0.000		20 1	0.992	-6.208	48.000	27.000	0.000 [0.000
1	20	0.992	-6.208	48.000	27.000	0.000	0.000			0.985		and the second second	married and the same		0.000
1	21	0.985	-5.852	46.000	23.000	0.000	0.000		21	0.985	-5.852	46.000	23.000	0.000	0.000
1	22	0.987	-6.608	45.000	22.000	0.000	0.000		22		-6.608	45.000			
1	23	0.973	-7.193	25.000	12.000	0.000	0.000		23	0.973	-7.193	25.000	12.000	0.000	0.000
1	24	0.969	-7.419	54.000	27.000	0.000	0.000		24	0.969	-7.419	54.000	27.000	0.000	0.000
1	25	0.969	-6.855	28.000	13.000	0.000	0.000	1	25	0.969	-6.855	28.000	13.000	0.000	0.000
1	26	1.015	-1.803	40.000	20.000	60.000	27.534	1	26	1.015	-1.803	40.000	20.000	60.000	27.534
	Total			1263.000	637.000	1278.340	638.948		Total			1263.000	637.000	1278.358	638.950

COMPARING LINE FLOW SOLUTION OF BOTH GAUSS SIDEL AND NEWTON RAPHSON

We can see that the final solutions obtained are the same but the number of iterations taken by Gauss Sidel method (30 iterations) is more than that of Newton Raphson method (4 iterations).

The loss calculations using the both methods are shown below for every line:

			(GAUSS SIDE	L SOLUTION			
	2 1 17	DIT						
	1) Y			ITTON				
			FLOW SOLU					
	333		LOSSES SO	DLUIION				
	4) EX	.11						
Cho	ose yo	ur	option :	3				
				Line	Flow and L	osses		
	Lir	ie	- Power	rat bus &	line flow	Li	ne loss	
	from	to	MW c	Mvar	MVA	MW	Mvar	
	1		668.340	151.081	685.203			
		2	362.744	65.024	368.526	0.713	0.027	
					317.550			
	2		E7 000	-127.255	120 420			
	2	4			367.819	0 712	0.037	
					122.850			
					77.188			
					148.540			
					68.345			
					8.302			
		20	0.130	1.30/	0.302	0.021	0.130	
	3		-44.000	96.534	106.089			
		2	-121.823	11.878	122.400	0.127	-2.963	
		13	77.825	84.657	114.994	0.084	0.587	
	4		75.000	282.528	292.314			
	51				128.732	0.120	3.587	
		-			186.905			

Command W	indo						
	inao	LA DISTANCE I LINES AND INC.	21-22-1-12-12-12-12-12-12-12-12-12-12-12	Victoria de la reconstruita			
5	6		62.526 62.994		4.500	-1.788	
6		-76.000	-29.000	81.345			
	5	-245.712	-64.782	254.109	4.500	-1.788	
	7	43.132	-29.685	52.360	0.139	0.607	
	11	21.151	10.021	23.405	0.052	0.286	
	18	-59.989	2.943	60.061	0.127	0.542	
	19	101.658	29.519	105.857	0.188	-1.445	
	21	63.437	23.060	67.498	0.125	-0.343	
7	-	0.000			0.550	0.250	
		-76.271					
		-42.993				0.607	
			-78.065				
	9	92.4/5	40.729	101.04/	-0.057	-0.667	
8		0.000	0.000	0.000			
	2	-142.066	36.848	146.767	1.485	-1.322	
	4	27.056	-122.295	125.252	0.120	3.587	
		-26.561		82.872		0.436	
	12	141.441	6.995	141.614	0.257	-0.637	
9		-89.000	-50.000	102.083			
(5 .0)	7		-41.415		-0.057	-0.687	
	10		-8.584			-0.158	
10		0.000	0.000	0.000			
	9				-0.009	-0.158	
			-92.626				
	19					0.157	
	20		39.235				
			39.473				
9.9		_25 000	_15 000	20 155			
11	-		-15.000		0.050	0.000	
			-9.735			0.286	
	25	24.079	3.437	24.323	0.519	-0.320	
	26	-28.059	-8.697	29.376	0.118	0.014	
12		-89.000	-48.000	101.119			
**	4		-153.198		0.404	3.532	
		-141.184		141.390	0.257		
	10	122.576	93.653	154.259	0.472	1.027	
	14	5.965	4.574	7.517	0.018	0.044	
	15	25.063	14.603	29.007	0.146	0.486	
13		-31.000	-15.000	34.438			
	2	-68.167	2.032	68.197	0.119	-0.811	
	3	-77.741	-84.070	114.505	0.084	0.587	
	14		22.930		0.103	0.451	
	15		19.286		0.190		
	16		24.828		0.296		
14		-24.000	-12.000	26.833			
	12	-5.947	-4.530	7.476	0.018	0.044	
	13	-44.445	-22.478	49.806	0.103	0.451	
			15.009		0.062	0.344	
15		-70 000	-31.000	76.557			
13	4.0				0 245	0 400	
			-14.117		0.146		
	13	-36.349	-18.285	40.689	0.190	1.001	
	14	-26.330	-14.665	30.139	0.062	0.344	
	16	17.596	16.066	23.827	0.118	0.288	
		F.F. 225	00.000	60 600			
16	6336		-27.000		gia garanan		
	13	-33.505	-23.522	40.938	0.296	1.306	

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Com	nmand W	Vindo	N					
	17		78 000	28 000	96 764			
	17	16		-38.000		0.257	0 156	
					16.015 94.673			
		21	3.527		3.529			
		21	3.327	0.113	3.325	0.029	0.036	
	18		-153.000	-67.000	167.027			
		1	-304.340	-87.416	316.646	1.261	-1.128	
		6	60.116	-2.401	60.164	0.127	0.542	
		17	91.223	22.817	94.034	-0.043	-2.349	
	19		-75 000	-15.000	76.485			
	7.5	6			106.090	0.188	-1.445	
					8.036			
		23			13.454			
					18.410			
		25		4.212	6.939		-0.647	
	20			-27.000				
					73.084			
			-5.133		5.199			
			-1.854					
		22	21.067	5.923	21.884	0.073	0.178	
	21		-46.000	-23.000	51.430			
		6			67.499	0.125	-0.343	
		17	-3.499	-0.057	3.499	0.029	0.056	
		20	1.872	-4.774	5.128	0.018	0.043	
		24	18.939	5.234	19.648	0.189	0.600	
	22		-45.000	-22 000	E0 000			
	22		-56.731			0 202	0.455	
					21.766	0.283		
		23			16.015			
					23.872		200 SECTION 100	
ç			13.300	10.000	20.072	0.102	0.010	
	23		-25.000	-12.000	27.731			
		19	-11.300	-6.971	13.277	0.056	0.244	
		22	-12.667	-9.439	15.797	0.076	0.261	
		25	-1.033	4.410	4.529	0.021	0.025	
	24		_54 000	-27.000	60.374			
	27	10	-15.452			0.084	0.058	
			-18.749					
			-10.749					
		10/00						
	25	5050		-13.000			B) Water	
			-23.560	-3.756			-0.320	
		19	-5.495	-4.859	7.335	0.020	-0.647	
		23	1.055	-4.385	4.510	0.021	0.025	
	26		20.000	7.534	21.372			
	_	2			8.261	0.021	0.130	
		11					0.014	
	887	8 8				200 50000	ST 20740	
	Tota	l los	33			13.969	3.181	

And by Newton Raphson method we get:

Li	ne	Power	at bus &	line flow	Li	ne loss
from	to	MW	Mvar	MVA	MW	Mvar
1		668.358	151.079	685.221		
	2	362.754	65.023	368.535	0.713	0.028
	18	305.604	86.287	317.552	1.261	-1.128
2		57.000	-127.254	139.436		
	1	-362.040	-64.995	367.828	0.713	0.028
	3	121.952	-14.840	122.852	0.127	-2.962
	7	76.830	-7.442	77.190	0.558	-0.350
	8	143.554	-38.170	148.542	1.485	-1.322
	13	68.287	-2.843	68.346	0.119	-0.811
	26	8.198	1.307	8.302	0.021	0.130
3		-44.000	96.534	106.089		
	2	-121.825	11.878	122.402	0.127	-2.962
	13	77.821	84.658	114.992	0.084	0.587
4		75.000	282.529	292.314		
	8	-26.938	125.882	128.732	0.120	3.587
	12	101.827	156.730	186.904	0.404	3.532
5		250.000	62.527	257.701		
	6	250.211	62.995	258.019	4.500	-1.788
6		-76.000	-29.000	81.345		
	5	-245.711	-64.783	254.108	4.500	-1.788
	7	43.133	-29.684	52.360	0.139	0.607
	11	21.151	10.021	23.405	0.052	0.286
	18	-59.992	2.943	60.065	0.127	0.542
	19	101.658	29.519	105.857	0.188	-1.445
	21	63.437	23.060	67.498	0.125	-0.343

7		0.000	0.000	0.000			
	2	-76.272	7.091	76.601	0.558	-0.350	
	6	-42.994	30.291	52.593	0.139	0.607	
	8	26.637	-78.065	82.484	0.078	0.436	
	9	92.476	40.729	101.048	-0.057	-0.687	
8		0.000	0.000	0.000			
	2	-142.069	36.848	146.769	1.485	-1.322	
	4	27.057	-122.295	125.252	0.120	3.587	
	7	-26.558	78.500	82.871	0.078	0.436	
	12	141.441	6.994	141.614	0.257	-0.637	
9		-89.000	-50.000	102.083			
	7	-92.533	-41.415	101.378	-0.057	-0.687	
	10	3.523	-8.584	9.279	-0.009	-0.158	
10		0.000	0.000	0.000			
	9	-3.532	8.426	9.137	-0.009	-0.158	
	12	-122.107	-92.625	153.263	0.472	1.027	
	19	6.038	5.502	8.168	0.036	0.157	
	20	62.427	39.236	73.733	0.348	0.669	
	22	57.013	39.473	69.344	0.283	0.455	
11		-25.000	-15.000	29.155			
	6	-21.099	-9.735	23.237	0.052	0.286	
	25	24.079	3.437	24.323	0.519	-0.320	
	26	-28.059	-8.697	29.376	0.118	0.014	
12		-89.000	-48.000	101.119			
	4	-101.423	-153.198	183.728	0.404	3.532	
	8	-141.184	-7.632	141.390	0.257	-0.637	
	10	122.579	93.653	154.261	0.472	1.027	
	14	5.965	4.574	7.517	0.018	0.044	
	15	25.063	14.603	29.007	0.146	0.486	

J	0	m	m	a	nc	W	ir	ıd	O	W	

13		-31.000	-15.000	34.438		
	2	-68.168	2.032	68.198	0.119	-0.811
	3	-77.737	-84.071	114.503	0.084	0.587
	14	44.548	22.930	50.103	0.103	0.451
	15	36.539	19.286	41.317	0.190	1.001
	16	33.801	24.828	41.940	0.296	1.306
14		-24.000	-12.000	26.833		
	12	-5.947	-4.530	7.476	0.018	0.044
	13	-44.445	-22.479	49.806	0.103	0.451
	15	26.392	15.009	30.361	0.062	0.344
15		-70.000	-31.000	76.557		
	12	-24.917	-14.117	28.638	0.146	0.486
	13	-36.349	-18.285	40.689	0.190	1.001
	14	-26.330	-14.665	30.139	0.062	0.344
	16	17.596	16.066	23.827	0.118	0.288
16		-55.000	-27.000	61.270		
	13	-33.505	-23.522	40.937	0.296	1.306
	15	-17.478	-15.778	23.546	0.118	0.288
	17	-9.157	13.112	15.993	0.257	0.156
	20	5.139	-0.811	5.203	0.007	0.016
17		-78.000	-38.000	86.764		
	16	9.414	-12.956	16.015	0.257	0.156
	18	-91.267	-25.166	94.673	-0.043	-2.349
	21	3.527	0.113	3.529	0.029	0.056
18		-153.000	-67.000	167.027		
	1	-304.343	-87.415	316.648	1.261	-1.128
	6	60.119	-2.401	60.167	0.127	0.542
	17	91.224	22.817	94.034	-0.043	-2.349

17 91.224 22.817 94.034 -0.043 -2.349 19	Comm	and Wi	ndo	W					
6 -101.471 -30.963 106.090 0.188 -1.445 10 -6.001 -5.345 8.036 0.036 0.157 23 11.355 7.215 13.454 0.056 0.244 24 15.536 9.876 18.410 0.084 0.058 25 5.514 4.212 6.939 0.020 -0.647 20 -48.000 -27.000 55.073 10 -62.079 -38.567 73.084 0.348 0.669 16 -5.133 0.827 5.199 0.007 0.016 21 -1.855 4.817 5.161 0.018 0.043 22 21.067 5.923 21.883 0.073 0.178 21 -46.000 -23.000 51.430 6 -63.312 -23.403 67.499 0.125 -0.343 17 -3.499 -0.057 3.499 0.029 0.056 20 1.872 -4.774 5.128 0.018 0.043 24 18.939 5.234 19.648 0.189 0.600 22 -45.000 -22.000 50.090 10 -56.730 -39.019 68.853 0.283 0.455 20 -20.994 -5.745 21.765 0.073 0.178 23 12.743 9.700 16.015 0.076 0.261 24 19.980 13.063 23.871 0.182 0.515 23 -25.000 -12.000 27.731 19 -11.300 -6.971 13.277 0.056 0.244 22 -12.667 -9.439 15.797 0.076 0.261 25 -1.033 4.410 4.530 0.021 0.025 24 -54.000 -27.000 60.374 19 -15.452 -9.818 18.308 0.084 0.058 21 -18.749 -4.634 19.313 0.189 0.600 22 -19.799 -12.548 23.440 0.182 0.515 25 -28.000 -13.000 30.871 11 -23.560 -3.756 23.857 0.519 -0.320 19 -5.495 -4.859 7.335 0.020 -0.647 23 1.055 -4.385 4.510 0.021 0.025 26 20.000 7.534 21.372 2 -8.177 -1.177 8.261 0.021 0.025 26 20.000 7.534 21.372 2 -8.177 -1.177 8.261 0.021 0.014			17	91.2	24 22.81	7 94.034	-0.043	-2.349	
6 -101.471 -30.963 106.090 0.188 -1.445 10 -6.001 -5.345 8.036 0.036 0.157 23 11.355 7.215 13.454 0.056 0.244 24 15.536 9.876 18.410 0.084 0.058 25 5.514 4.212 6.939 0.020 -0.647 20 -48.000 -27.000 55.073 10 -62.079 -38.567 73.084 0.348 0.669 16 -5.133 0.827 5.199 0.007 0.016 21 -1.855 4.817 5.161 0.018 0.043 22 21.067 5.923 21.883 0.073 0.178 21 -46.000 -23.000 51.430 6 -63.312 -23.403 67.499 0.125 -0.343 17 -3.499 -0.057 3.499 0.029 0.056 20 1.872 -4.774 5.128 0.018 0.043 24 18.939 5.234 19.648 0.189 0.600 22 -45.000 -22.000 50.090 10 -56.730 -39.019 68.853 0.283 0.455 20 -20.994 -5.745 21.765 0.073 0.178 23 12.743 9.700 16.015 0.076 0.261 24 19.980 13.063 23.871 0.182 0.515 23 -25.000 -12.000 27.731 19 -11.300 -6.971 13.277 0.056 0.244 22 -12.667 -9.439 15.797 0.076 0.261 25 -1.033 4.410 4.530 0.021 0.025 24 -54.000 -27.000 60.374 19 -15.452 -9.818 18.308 0.084 0.058 21 -18.749 -4.634 19.313 0.189 0.600 22 -19.799 -12.548 23.440 0.182 0.515 25 -28.000 -13.000 30.871 11 -23.560 -3.756 23.857 0.519 -0.320 19 -5.495 -4.859 7.335 0.020 -0.647 23 1.055 -4.385 4.510 0.021 0.025 26 20.000 7.534 21.372 2 -8.177 -1.177 8.261 0.021 0.025 26 20.000 7.534 21.372 2 -8.177 -1.177 8.261 0.021 0.014									
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fx 22 -19.799 -12.548 23.440 0.182 0.515 25 -28.000 -13.000 30.871 11 -23.560 -3.756 23.857 0.519 -0.320 19 -5.495 -4.859 7.335 0.020 -0.647 23 1.055 -4.385 4.510 0.021 0.025 26 20.000 7.534 21.372 2 -8.177 -1.177 8.261 0.021 0.130 11 28.177 8.710 29.492 0.118 0.014									
25	$f_{\underline{x}}$		22	-19.79	99 -12.54				
11 -23.560 -3.756 23.857 0.519 -0.320 19 -5.495 -4.859 7.335 0.020 -0.647 23 1.055 -4.385 4.510 0.021 0.025 26 20.000 7.534 21.372 2 -8.177 -1.177 8.261 0.021 0.130 11 28.177 8.710 29.492 0.118 0.014			0,0000						
11 -23.560 -3.756 23.857 0.519 -0.320 19 -5.495 -4.859 7.335 0.020 -0.647 23 1.055 -4.385 4.510 0.021 0.025 26 20.000 7.534 21.372 2 -8.177 -1.177 8.261 0.021 0.130 11 28.177 8.710 29.492 0.118 0.014	25		-2	8.000	-13.000	30.871			
19 -5.495 -4.859 7.335 0.020 -0.647 23 1.055 -4.385 4.510 0.021 0.025 26 20.000 7.534 21.372 2 -8.177 -1.177 8.261 0.021 0.130 11 28.177 8.710 29.492 0.118 0.014		11	-2	3.560	-3.756	23.857	0.519	-0.320	
23 1.055 -4.385 4.510 0.021 0.025 26 20.000 7.534 21.372 2 -8.177 -1.177 8.261 0.021 0.130 11 28.177 8.710 29.492 0.118 0.014									
26 20.000 7.534 21.372 2 -8.177 -1.177 8.261 0.021 0.130 11 28.177 8.710 29.492 0.118 0.014									
2 -8.177 -1.177 8.261 0.021 0.130 11 28.177 8.710 29.492 0.118 0.014		20			1.000	1.010	0.021	0.020	
2 -8.177 -1.177 8.261 0.021 0.130 11 28.177 8.710 29.492 0.118 0.014	26		-	0.000	7 524	21 272			
11 28.177 8.710 29.492 0.118 0.014	20	~					0.000	0.000	
Total loss 13.969 3.182		11	2	8.177	8.710	29.492	0.118	0.014	
Total loss 13.969 3.182									
	Tota	al los	3				13.969	3.182	

And so we get the same losses from both the methods.

SCREEN-SHOTS:

Command Window

Choose your option: 2

Fower Flow Solution - Fast Decoupled Method 20 Iterations

	Bus Voltage			2	Angle	Lo	oad	L		Genera	at:	ion	
	No.		Mag.		Degree		MW		Mvar		MW		Mvar
1	1	1	1.025	1	0.000	1	51.000	1	41.000	1	719.358	1	192.077
1	2	1	1.020	1	-0.934	1	22.000	1	15.000	1	79.000	1	-112.254
T	3	Ī	1.025	Ī	-4.374	T	64.000	T	50.000	T	20.000	Ī	146.536
.1.	4	J.	1.050	J.	-4.008	1	25.000	1	10.000	J.	100.000	J.	292.530
1	5	1	1.045	1	1.171	1	50.000	1	30.000	1	300.000	1	92.527
1	6	1	1.010	1	-2.630	1	76.000	1	29.000	1	0.000	1	0.000
T	7	Ī	1.016	1	-3.456	T	0.000	Ī	0.000	T	0.000	Ī	0.000
J.	8	J.	1.021	J.	-3.609	1	0.000	J.	0.000	J.	0.000	J.	0.000
1	9	1	0.998	1	-5.677	1	89.000	1	50.000	1	0.000	1	0.000
1	10	1	1.002	1	-5.782	1	0.000	1	0.000	1	0.000	1	0.000
T	11	T	1.002	Ī	-3.258	T	25.000	Ī	15.000	T	0.000	Ĭ	0.000
.1.	12	1	1.017	J.	-5.004	J.	89.000	J.	48.000	J.	0.000	J.	0.000
1	13	1	1.020	1	-4.576	1	31.000	1	15.000	1	0.000	1	0.000
1	14	1	1.012	1	-5.187	1	24.000	1	12.000	1	0.000	1	0.000
T	15	Ī	1.004	T	-5.697	Ĩ	70.000	Ĩ	31.000	T	0.000	Ī	0.000
.1.	16	1	0.993	J.	-6.022	.1.	55.000	J.	27.000	J.	0.000	J.	0.000
1	17	1	0.994	1	-4.949	1	78.000	1	38.000	1	0.000	1	0.000
1	18	1	1.011	1	-1.876	1	153.000	1	67.000	1	0.000	1	0.000
T	19	T	0.986	T	-6.434	T	75.000	Ī	15.000	Ť	0.000	Ī	0.000
.1.	20	J.	0.992	J.	-6.208	J.	48.000	J.	27.000	J.	0.000	J.	0.000
1	21	1	0.985	1	-5.852	1	46.000	1	23.000	1	0.000	1	0.000
1	22	1	0.987	1	-6.608	1	45.000	1	22.000	1	0.000	1	0.000
T	23	Ī	0.973	Ī	-7.193	T	25.000	Ī	12.000	T	0.000	Ī	0.000
J.	24	J.	0.969	1	-7.419	I.	54.000	J.	27.000	J.	0.000	J.	0.000
1	25	1	0.969	1	-6.855	1	28.000	1	13.000	1	0.000	1	0.000
1	26	1	1.015	1	-1.803	1	40.000	1	20.000	1	60.000	1	27.534
	Tota	al				1	263.000		637.000	0	1278.3	58	638.950

Line Flow and Losses

Lir	ne	Power	at bus &	line flow	Line	loss
from	to	MW	Mvar	MVA	MW	Mvar
1		668.358	151.077	685.220		
	2	362.753	65.023	368.534	0.713	0.028
	18	305.606	86.288	317.554	1.261	-1.128
2		57.000	-127.254	139.436		
	1	-362.039	-64.995	367.827	0.713	0.028
	3	121.952	-14.840	122.851	0.127	-2.962
	7	76.830	-7.442	77.190	0.558	-0.350
	8	143.554	-38.170	148.542	1.485	-1.322
	13	68.286	-2.843	68.345	0.119	-0.811
	26	8.198	1.307	8.302	0.021	0.130
3		-44.000	96.536	106.091		
	2	-121.824	11.878	122.402	0.127	-2.962
	13	77.820	84.658	114.991	0.084	0.587
4		75.000	282.530	292.315		
	8	-26.938	125.882	128.732	0.120	3.587
	12	101.827	156.730	186.904	0.404	3.532
5		250.000	62.527	257.701		
	6	250.211	62.995	258.020	4.500	-1.788
6		-76.000	-29.000	81.345		
	5	-245.711	-64.783	254.108	4.500	-1.788
	7	43.132	-29.685	52.360	0.139	0.607
	11	21.151	10.021	23.405	0.052	0.286
	18	-59.992	2.943	60.064	0.127	0.542
	19	101.658	29.519	105.857	0.188	-1.445
	21	63.437	23.060	67.498	0.125	-0.343

Command Window

	7		0.000	0.000	0.000			
		2	-76.272	7.091	76.601	0.558	-0.350	
		6	-42.994	30.291	52.593	0.139	0.607	
		8	26.636	-78.065	82.484	0.078	0.436	
		9	92.476	40.729	101.047	-0.057	-0.687	
	8		0.000	0.000	0.000			
		2	-142.068	36.848	146.769	1.485	-1.322	
		4	27.057	-122.295	125.252	0.120	3.587	
		7	-26.558	78.500	82.871	0.078	0.436	
		12	141.441	6.994	141.613	0.257	-0.637	
	9		-89.000	-50.000	102.083			
		7	-92.533	-41.415	101.378	-0.057	-0.687	
		10	3.523	-8.584	9.279	-0.009	-0.158	
	10		0.000	0.000	0.000			
		9	-3.532	8.426	9.137	-0.009	-0.158	
		12	-122.107	-92.625	153.263	0.472	1.027	
		19	6.038	5.502	8.168	0.036	0.157	
		20	62.426	39.236	73.733	0.348	0.669	
		22	57.013	39.473	69.344	0.283	0.455	
	11		-25.000	-15.000	29.155			
		6	-21.099	-9.735	23.237	0.052	0.286	
		25	24.079	3.437	24.323	0.519	-0.320	
		26	-28.059	-8.697	29.376	0.118	0.014	
	12		-89.000	-48.000	101.119			
		4	-101.423	-153.198	183.728	0.404	3.532	
		8	-141.183	-7.632	141.390	0.257	-0.637	
		10	122.578	93.653	154.260	0.472	1.027	
		14	5.965	4.574	7.517	0.018	0.044	
fx		15	25.063	14.603	29.006	0.146	0.486	
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fx

13		-31.000	-15.000	34.438			
	2	-68.168	2.032	68.198	0.119	-0.811	
	3	-77.736	-84.071	114.502	0.084	0.587	
	14	44.548	22.930	50.103	0.103	0.451	
	15	36.539	19.286	41.316	0.190	1.001	
	16	33.800	24.828	41.939	0.296	1.306	
14		-24.000	-12.000	26.833			
	12	-5.947	-4.530	7.476	0.018	0.044	
	13	-44.445	-22.479	49.806	0.103	0.451	
	15	26.392	15.009	30.361	0.062	0.344	
15		-70.000	-31.000	76.557			
	12	-24.916	-14.117	28.637	0.146	0.486	
	13	-36.349	-18.285	40.689	0.190	1.001	
	14	-26.330	-14.665	30.138	0.062	0.344	
	16	17.594	16.066	23.826	0.118	0.288	
16		-55.000	-27.000	61.270			
	13	-33.504	-23.522	40.937	0.296	1.306	
	15	-17.477	-15.778	23.545	0.118	0.288	
	17	-9.155	13.111	15.991	0.257	0.156	
	20	5.141	-0.811	5.204	0.007	0.016	
17		-78.000	-38.000	86.764			
	16	9.412	-12.955	16.013	0.257	0.156	
	18	-91.268	-25.166	94.674	-0.043	-2.349	
	21	3.527	0.113	3.529	0.029	0.056	
18		-153.000	-67.000	167.027			
	1	-304.344	-87.416	316.650	1.261	-1.128	
	6	60.119	-2.401	60.166	0.127	0.542	
	17	91.225	22.817	94.035	-0.043	-2.349	

19			-75.000	-15.000	76.485			
					106.090	0.188	-1.445	
	10		-6.001	-5.345	8.036	0.036	0.157	
	23		11.356	7.215	13.454	0.056	0.244	
	24		15.536	9.876	18.410	0.084	0.058	
	25		5.514	4.212	6.939	0.020	-0.647	
	2.		3.311	1.212	0.333	0.020	0.017	
20			-48.000	-27.000	55.073			
	10)	-62.078	-38.567	73.083	0.348	0.669	
	16	5	-5.134	0.827	5.200	0.007	0.016	
	21	les.	-1.854	4.816	5.161	0.018	0.043	
	22	2	21.067	5.923	21.884	0.073	0.178	
21			-46.000	-23.000	51.430			
	6			-23.403	67.499	0.125	-0.343	
	17		-3.498	-0.057	3.499	0.029	0.056	
	20)	1.872	-4.774	5.128	0.018	0.043	
	24	ł	18.938	5.234	19.648	0.189	0.600	
22			-45.000	-22.000	50.090			
22	10		-56.730	-39.019	68.853	0.283	0.455	
	20		-20.994	-5.745	21.766	0.073	0.178	
	23		12.744	9.700	16.015	0.076	0.261	
	24		19.980	13.063	23.872	0.182	0.515	
			13.300	10.000	20.072	0.102	0.010	
23			-25.000	-12.000	27.731			
	19	•	-11.300	-6.971	13.277	0.056	0.244	
	22	2	-12.667	-9.439	15.797	0.076	0.261	
	25	5	-1.034	4.410	4.530	0.021	0.025	
2	24		-54.000	-27.000	60.374			
		19	-15.452	-9.818	18.308	0.084	0.058	
		21	-18.749	-4.634	19.313	0.189	0.600	
		22	-19.799	-12.548	23.440	0.182	0.515	
2	25		-28.000	-13.000	30.871			
		11	-23.560	-3.756	23.857	0.519	-0.320	
		19	-5.495	-4.859	7.335	0.020	-0.647	
		23	1.055	-4.385	4.510	0.021	0.025	
3	26		20.000	7.534	21.372			
	1074 U	2				0.021	0.130	
		11			29.492	0.118	0.014	
		86		5.710		2.220	3.511	
1	Cotal	10	33			13.969	3.182	
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fx.