Appendix A

Data for 6-bus test system

The 6-bus test system is shown in Fig. A.1 The system data is taken from [149]. The data are on 100 MVA base. The relevant data are provided in the following tables.

Table A.1: Generator bus data

Bus no.	Scheduled real power generation (P_g) (MW)	Specified voltage magnitude (V_g)(pu)	Load demand	
			Real, (P_d)(MW)	Reactive, (Q_d) (MVAR)
1(slack)	0	1.05	0	0
2	50	1.05	0	0
3	60	1.07	0	0

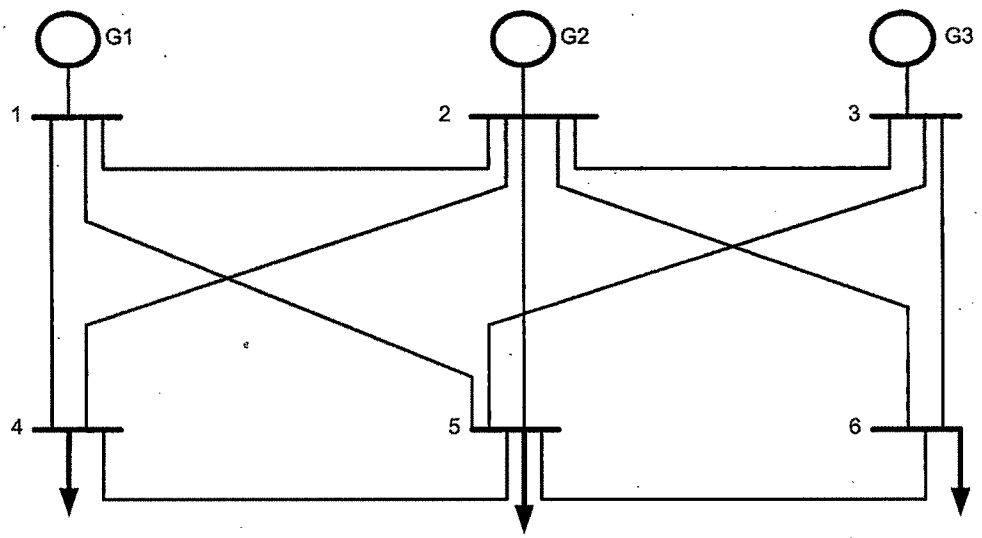

Figure A.1: IEEE 6 bus test system

Table A.2: Generator data

Gen. no.	Real power generation limit (MW)		Reactive power generation limit (MVAR)		Voltage magnitude limit (pu)	
	P_{max}	P_{min}	Q_{max}	Q_{min}	V_{max}	V_{min}
1	200	50	100	-100	1.05	1.05
2	150	37.5	100	-100	1.05	1.05
3	180	45	100	-100	1.07	1.07

Table A.3: Load bus data

Bus no.	Load		Voltage magnitude limit (pu)	
	P_d (MW)	Q_d (MVAR)	V_{max}	V_{min}
4	70	70	1.05	0.95
5	70	70	1.05	0.95
6	70	70	1.05	0.95

Table A.4: Transmission line data

Line no.	From bus	To bus	Series impedance		Total Shunt susceptance, b (pu)	Rating (MVA)
			Resistance, r (pu)	Reactance, x (pu)		
1	1	2	0.1	0.2	0.04	40
2	1	4	0.05	0.2	0.04	60
3	1	5	0.08	0.3	0.06	40
4	2	3	0.05	0.25	0.06	40
5	2	4	0.05	0.1	0.02	60
6	2	5	0.1	0.3	0.04	30
7	2	6	0.07	0.2	0.05	90
8	3	5	0.12	0.26	0.05	70
9	3	6	0.02	0.1	0.02	80
10	4	5	0.2	0.4	0.08	20
11	5	6	0.1	0.3	0.06	40

Table A.5: Generator active and reactive power cost functions

Gen no.	a_m ($/MW^{2}h)	b_m($/MWh)	c_m
1	0.00533	11.669	213.1
2	0.00889	10.333	200
3	0.00741	10.833	240

- Active power cost function:

$C_{Gm}(P_{Gm})=a_m(P_{Gm})^2+b_m(P_{Gm})+C_m$
where, a_m, b_m and $c_m$are pre-determined cost coefficients
P_{Gm}: Active power output of a mth generator

- Reactive power cost function:

$C_{Gm}(Q_{Gm})=a_m(Q_{Gm})^2+b_m(Q_{Gm})+C_m$
where, a_m, b_m and $c_m$are pre-determined cost coefficients
Q_{Gm}: Reactive power output of a mth generator

Table A.6: Consumers bid functions

Load bus no.	a_n ($/MW^{2}h)	b_n($/MWh)	c_n
4	-0.15	40	0
5	-0.05	44	0
6	-0.08	39	0

- Consumer bid function:

$B_{Dn}(P_{Dn})=a_n(P_{Dn})^2+b_n(P_{Dn})+C_n$
where, a_n, b_n and $c_n$are pre-determined cost coefficients
P_{Dn}: Active power demand of a n^{th} consumer