IEEE 14-BUS MODIFIED TEST SYSTEM DATA

Nomenclature

Rated MVA	Machine-rated MVA; base MVA for impedances
Rated kV	Machine-rated terminal voltage in kV; base kV for impedances
H	Inertia constant in s
D	Machine load damping coefficient
r_a	Armature resistance in p.u.
x_d	Unsaturated *d* axis synchronous reactance in p.u.
x_q	Unsaturated *q* axis synchronous reactance in p.u.
x'_d	Unsaturated *d* axis transient reactance in p.u.
x'_q	Unsaturated *q* axis transient reactance in p.u.
x''_d	Unsaturated *d* axis subtransient reactance in p.u.
x''_q	Unsaturated *q* axis subtransient reactance in p.u.
$x_l \; or \; x_p$	Leakage or Potier reactance in p.u.
T'_{d0}	*d* axis transient open circuit time constant in s
T'_{q0}	*q* axis transient open circuit time constant in s
T''_{d0}	*d* axis subtransient open circuit time constant in s
T''_{q0}	*q* axis subtransient open circuit time constant in s
$S(1.0)$	Machine saturation at 1.0 p.u. voltage in p.u.
$S(1.2)$	Machine saturation at 1.2 p.u. voltage in p.u.
T_r	Regulator input filter time constant in s
K_a	Regulator gain (continuous acting regulator) in p.u.
T_a	Regulator time constant in s
V_{Rmax}	Maximum regulator output, starting at full load field voltage in p.u.
V_{Rmin}	Minimum regulator output, starting at full load field voltage in p.u.
K_e	Exciter self-excitation at full load field voltage in p.u.
T_e	Exciter time constant in s
K_f	Regulator stabilizing circuit gain in p.u.
T_f	Regulator stabilizing circuit time constant in s
E_1	Field voltage value,1 in p.u.
$SE(E_1)$	Saturation factor at E_1
E_2	Field voltage value,2 in p.u.
$SE(E_2)$	Saturation factor at E_2
P_{max}	Maximum turbine output in p.u.
R	Turbine steady-state regulation setting or droop in p.u.
T_1	Control time constant (governor delay) in s
T_2	Hydro reset time constant in s
T_3	Servo time constant in s
T_4	Steam valve bowl time constant in s
T_5	Steam reheat time constant in s
F	Shaft output ahead of reheater in p.u.

TABLE I
IEEE 14-BUS MODIFIED TEST SYSTEM MACHINE DATA

Type	GENROU	GENROU	GENROU	GENROU
Operation	Sync. Gen.	Sync. Gen.	Condenser	Condenser
Default Unit no. (New Unit no.)	1(15)	2(16)	3(17)	6(19), 8(18)
Rated power (MVA)	448	100	40	25
Rated voltage (kV)	22	13.8	13.8	13.8
Rated pf	0.85	0.8	0.0	0.0
H (s)	2.656	4.985	1.520	1.200
D	2.000	2.000	0.000	0.000
r_a (p.u)	0.0043	0.0035	0.000	0.0025
x_d (p.u)	1.670	1.180	2.373	1.769
x_q (p.u)	1.600	1.050	1.172	0.855
x'_d (p.u)	0.265	0.220	0.343	0.304
x'_q (p.u)	0.460	0.380	1.172	0.5795
x''_d (p.u)	0.205	0.145	0.231	0.2035
x''_q (p.u)	0.205	0.145	0.231	0.2035
x_l or x_p (p.u)	0.150	0.075	0.132	0.1045
T'_{d0} (s)	0.5871	1.100	11.600	8.000
T'_{q0} (s)	0.1351	0.1086	0.159	0.008
T''_{d0} (s)	0.0248	0.0277	0.058	0.0525
T''_{q0} (s)	0.0267	0.0351	0.201	0.0151
$S(1.0)$	0.091	0.0933	0.295	0.304
$S(1.2)$	0.400	0.4044	0.776	0.666

TABLE II
IEEE 14-BUS MODIFIED TEST SYSTEM EXCITER DATA

Type	IEEET1	IEEET1	IEEET1	IEEET1
Default Unit no. (New Unit no.)	1(15)	2(16)	3(17)	6(19), 8(18)
Rated power (MVA)	448	100	40	25
Rated voltage (kV)	22	13.8	13.8	13.8
T_r (s)	0.000	0.060	0.000	0.000
K_a (p.u)	50	25	400	400
T_a (s)	0.060	0.200	0.050	0.050
V_{Rmax} (p.u)	1.000	1.000	6.630	4.407
V_{Rmin} (p.u)	-1.000	-1.000	-6.630	-4.407
K_e (p.u)	-0.0465	-0.0582	-0.170	-0.170
T_e (s)	0.520	0.6544	0.950	0.950
K_f (p.u)	0.0832	0.105	0.040	0.040
T_f (s)	1.000	0.350	1.000	1.000
E_1 (p.u)	3.240	2.5785	6.375	4.2375
$SE(E_1)$	0.072	0.0889	0.2174	0.2174
E_2 (p.u)	4.320	3.438	8.500	5.650
$SE(E_2)$	0.2821	0.3468	0.9388	0.9386

TABLE III
IEEE 14-BUS MODIFIED TEST SYSTEM GOVERNOR DATA

Type	BPA_GG	BPA_GG
Default Unit no. (New Unit no.)	1(15)	2(16)
Rated power (MVA)	448	100
Rated voltage (kV)	22	13.8
P_{max} (p.u)	0.870	1.050
R (p.u)	0.011	0.050
T_1 (s)	0.100	0.090
T_2 (s)	0.000	0.000
T_3 (s)	0.300	0.200
T_4 (s)	0.050	0.300
T_5 (s)	10.000	0.000
F	0.250	1.000