

Index Terms

Links

A

ABCD parameters	265				
Acceleration technique	355				
A.c. drive/motors	62	73	84	102	119
	140				
Active filter	219	255			
A/D converter	206				
Admittance					
compound	273	274	296		
coupled	296				
filter	222	231			
loci	228	318			
nodal	262	277	293	297	327
mutual	262	291	295		
phase	295				
primitive	293				
self	262	295	297		
series	297				
shunt	269	273	276	284	335
system	262	277	296	305	309
transfer	262	263			
transformer	295				
Admittance matrix	262	265	270	273	276
	282	291	295	306	317
	327	333	342	346	
equivalent	263	335			

<u>Index Terms</u>	<u>Links</u>				
Admittance compound (<i>Cont.</i>)					
network	295				
nodal	262	277	293	297	327
phase	295				
primitive	293				
shunt	281	282			
subsystem	265	273	275	277	295
	297	335	337	340	
system	262	276	296		
transformer	291				
transmission line	273				
Airgap flux	122				
Aliasing	33	34	35		
Amplitude spectrum	28				
Analogue harmonic analyzer	202				
Arc furnace	61	74	126		
Armature inductance	102				

B

Backward (reflecting) travelling wave					
Balanced system	266				
Balance (telephone)	184				
Bandwidth	30	40	43	45	
DFT filter	41				
FFT analyzer	43				
noise	43	44	56		
Beat frequencies	133				
Bell Telephone System (BTS)	10	178	189		
Bessel functions	285				
Bit reversal	35	37			
Blocking circuit (tuned stopper)	146				

Index Terms

Links

Budeanu	156	160
Burst firing	138	
Butterfly circuit	47	48

C

Cable dielectric stress	153		
Capacitive divider	198		
Capacitive voltage transformer	198		
Capacitor, cost	254		
filter	146	230	246
fluorescent light	78		
loss factor	156		
overloading of	145	156	
power factor correction	13	78	
power loss	249	252	
Carson’s equations	175	176	
CCITT directives	178	182	189
Characteristic harmonics	90	92	
Characteristic impedance	279		
CHART	210		
Chording	71		
CIGRE benchmark dc link	371		
C-message weighting	178	180	
Coaxial cable	206		
Coil span	71		
Communication interference	173		
Communication systems			
Carson	174	189	
conductive coupling	177		
earth resistivity	176	177	
electromagnetic induction	181		

Index Terms

Links

Carson (<i>Cont.</i>)				
electrostatic induction	174	176	185	
multiple earthed neutral (MEN)	177	186		
residual current	174	176		
residual voltage	176	177		
shielding factor	185			
susceptiveness	173	177		
Commutating				
current	93			
voltage	61			
Commutation				
angle (<i>see</i> Overlap)	93	94	95	110
circuit	93	94		
line	112	120		
reactance	102	106	109	
Compound admittance	273	275	296	
networks	273			
Computer models	290			
Computers (interference with)	172			
Conductive coupling	177			
Connection matrix	291	292		
Constant phase angle control	61			
Continuous function	17	25	27	
Converter	267	301	312	325 333
	335	342	348	
6-pulse	64	97	104	111
12-pulse	64	92	107	
commutation	93			
control	105			
controlled	104	120		
current source	85			

Index Terms

Links

Converter (<i>Cont.</i>)					
general p-phase	87				
half controlled	105				
multi-level	117				
pulse number	88	91	92		
transformer	64	90	104	108	
voltage source	116				
Convolution.	25	27	39	52	357
	358				
Copper loss	153				
Corona	153				
Coupled admittance	296				
Coupled series admittance	297				
Cross-modulation	116				
Cumulative probability function	209				
Current discontinuity	101				
Current Source Converter	85				
Current transformer	196				
air-gap	196				
burden	196	197	200		
clip-on	201				
frequency response	195				
multi-secondary	196				
remnant flux	196				
saturation	196				
toroidally wound	195				
unconventional	196				
Cycloconvertors	130	132			
switching function	133				

Index Terms

Links

D

Data presentation and displays	210			
cumulative probability	192	207	209	
histograms	207			
level plot	210			
three-dimensional	322			
Data transmission	206			
fibre optics	207			
pulse encoded systems	206			
Damped harmonic filters	220	235	236	237
Data acquisition	204			
Database	310			
Delay angle, (<i>see</i> Firing angle)				
Detuning (harmonic filters)	221	246	247	
Dielectric stress (cable)	153			
Differential protection	171			
Digital	191	202		
filters	202			
recording	204			
spectrum analysers	204			
Direct current	66	67	79	102
chopper	123			
current modulation	106	110	113	
drive	99			
filters (d.c. side)	253			
harmonics (d.c. side)	98	99	100	
magnetization	65			
motor	100			

<u>Index Terms</u>	<u>Links</u>				
Discrete Fourier transform (DFT)	17	33	35	40	45
	47				
filter	40				
picket fence	40				
Displacement angle	68				
Displacement factor	167				
Distance protection	171	188			
Distortion					
factor	151	167			
power	161	162	188		
Distribution factor	68				
Distribution system	298	303	317		
Double-circuit lines	308	314	318	326	
Double-tuned harmonic filters	233				
DSP (digital signal processor)	206				
Dubanton	283				

E

Earth					
current	285	298			
electrode	177				
impedance	282				
resistivity	283	285	314		
return	270	282	285	289	
wire	269	272	328	339	
Eddy currents	150				
Edison Electric Institute (EEI)	10	178			
Eigenvalue	281	282			
Eigenvector	281	282			
Electricite de France	267				
harmonic impedance measurement	267				

Index Terms

Links

Electricity Council Research Center	268				
Electrogyration effect	200				
Electromagnetic induction	174	175	181		
Electromagnetic Compatibility (EMC)	8				
Electro-optical effect	200				
EMTP	354				
EMTDC	375				
Equidistant firing angle control	62	106	110		
Equivalent circuits					
induction motor	302				
Norton	368				
telephone	172				
transformer	292				
Equivalent disturbing current (EDI)	179				
Equivalent PI model, multiconductor	281				
series impedance matrix	281				
shunt admittance matrix	281				
transmission line	278				
Even function	21				
Exposure factor	179				
F					
Faraday effect	197				
Fast Fourier transform (FFT)	17	24	27	35	37
	45	47			
analyzer	43				
bit reversal	35	37			
butterfly circuit	47	48			
mixed radix	48				
partial	50				
pruning	51				

Index Terms

Links

Fast Fourier transform (FFT) (<i>Cont.</i>)					
radix-2	47				
real valued	49	51			
split radix	50	51			
standard	52				
FDNE(Frequency dependent					
network equivalents)	370	373	379		
Ferraris motor principle	168				
Field tests	344				
Filters					
admittance	231	232			
automatically tuned	234	235			
costs and cost optimization	235	246	247		
C-type	236	244			
bandwidth	257				
damped	220	224	235		
d.c. side	253				
detuning	221	246			
DFT(Discrete Fourier Transform)	17	33	40	45	
double tuned	233				
high pass	220	225	235	239	242
	245				
impedance loci	228	230			
low pass	238				
nominal tuned frequency	221				
reactive power	221	234	243	246	247
relative frequency deviation	229				
second order	220	225	236		
single tuned	220	228	233	248	
third order	236	238			

Index Terms

Links

Firing angle	94	99	105	108	133
	137				
Firing angle modulation	134	135			
Firing asymmetry	108				
Firing delay	101	104	127		
Fluorescent lighting	76				
Forward (incident) travelling wave	316				
Fourier analysis	1	27	39	52	62
	102	133	135	138	
Fourier coefficients	18	45	86		
Fourier series	17	30	65	80	86
	90	92	105		
Fourier series complex form	23				
Fourier transform	17	27			
DFT(see Discrete Fourier Transform)					
FFT(see Fast Fourier Transform)					
forward transform	28				
reverse (inverse) transform	28				
transform pair	28	30	42		
Frequency domain	17	23	35	45	67
	87	92	121		
Frequency scan	264				
Frequency spectrum	17	30	33		
Functions					
continuous	17	25			
even	21				
odd	20				
orthogonal	19	52			
periodic	18				
piecewise continuous	19				
rectangular	28				

Index Terms

Links

Functions

continuous (<i>Cont.</i>)			
sampled	29		
spectral density	27		
switching	135		
window	38	41	

G

Gate turn off (GTO) thyristor	117	119	
Gaussian elimination	263		
Gaussian window function	44		
Graphical user interface (GUI)	305	307	309
Ground (<i>see</i> Earth)			
GTO, (<i>see</i> Gate Turn Off thyristor),			
Gyromagnetic material	197		

H

Half wave symmetry	21		
Hall effect	197		
Hamming window function	42	43	46
Hanning window function	42	43	46
Harmonic	1	17	
analyzer	201		
domain	25	356	
effects	143		
elimination	219		
filters <i>et seq.</i>	219		
imbalance	325		
injection	245		
losses	150		
measurements <i>et seq.</i>	191		

Index Terms

Links

Harmonic (<i>Cont.</i>)					
penetration	261				
phase angle	194				
power	5				
power flow	2	359			
power loss	5				
sources	61				
source identification	351	368			
standards	5				
state estimation	351	365			
symmetrical components	195				
torque	150				
weights	178				
Harmonic elimination, harmonic injection	245				
magnetic flux compensation	259				
PWM drive	123				
Harmonic impedance	261	266	286	290	298
	314	318	343		
measurement	266	268			
on-line derivation	266				
Harmonic interference					
computers	172				
communications <i>et seq.</i>	177				
converters	172				
lighting	172				
protection	170				
ripple control	169				
television	172				
Harmonic analysis					
advanced models	351				
balanced model	261				
direct solution	261				

Index Terms

Links

Harmonic analysis					
advanced models (<i>Cont.</i>)					
data handling	307				
examples of application	311				
iterative solution	353				
multiconvertor models	363				
structured diagrams	305	306	307		
three phase	262				
Harmonics	17				
a.c. motor	126				
characteristic	103	115			
current	63	80			
d.c. side	97	113			
even	87	105	110	123	125
fluctuating	191				
odd	22	64	65	94	
rotating machine	67				
slot	69	72			
subharmonics	115				
time	73	140			
triplen	63	69	71	77	89
	111	116	121	128	
uncharacteristic	105	109	326		
voltage	70	73			
zero sequence	312	313			
Hartley Transform	52				
Histograms	207				
Human ear (frequency response of)	178	182			
HVdc	335	337			
Hybrid time/frequency domain	354				
Hysteresis	62				

Index Terms

Links

I

IEC (International Electrotechnical Commission)	8	9		
IEC 61000	8	191		
IEEE 519	8	10		
IGBT (Insulated Gate Bipolar Transistor)	117	119		
IHA (Iterative Harmonic Analysis)	353			
Imbalance factor	326			
Impedance				
characteristic	279			
harmonic	223			
measurement of	266			
mutual	174	274	291	
self	274			
series	272	281		
shunt	272	281		
system	225			
Impedance loci	228	318		
circle diagram	226			
discrete polygons	227			
filter	220			
generator	319			
load	319			
positive sequence	347			
three-phase	324			
transformer	319			
Incident (forward) travelling wave	316			
Inductance, armature	102			
magnetizing	122			
power system harmonic filter	247			
Induction motor	73	119	130	140
Inrush current	64			

Index Terms

Links

Integral cycle control	61	138	140	
Interference factor (telephone)	172			
Inter-harmonic frequencies	6	193		
International Telegraph and Telephone Consultative Committee (CCITT)	178	182		
Inverter	62	103	117	119
Iron loss	150			
IT product	182			

J

Jacobian	356	358	359	362
----------	-----	-----	-----	-----

K

Kerr effect	200			
Kilowatt-hour meter, Ferraris	168			
solid state	169			
kVA metering	169			

L

Leakage admittance	293			
Leakage reactance	62			
Linear transformation	273			
Line parameter variation	273	282		
Load models	299	306	307	
Longitudinal electromagnetic induction	174			
Longitudinal electrostatic induction	174			
Long lines	277	285		
Loop induction	174			
Loss tangent tap	199			
Low pass filter	34	54		
Lumped PI model	269	273	282	

Index Terms

Links

M

Magnetizing current	63				
Magnetizing inductance	122				
MATLAB	306				
Measurements	191				
accuracy	195	197			
real time	192	202	204	205	210
Modal analysis	281				
series admittance	281				
shunt admittance	281				
Modulated phase angle control	61				
Modulation	106	110	112	116	134
Multi-level converter	117				
Multiple earthed neutral (MEN) system	177	186			
Multiconductor equivalent PI	281				
Mutual admittance	262	291	295		
Mutual coupling	314				
Mutual impedance	283	288	323	339	

N

Negative frequency	23	33			
Negative sequence	120	267	302	313	318
	325				
Newton’s method	356	358	360	363	
Nodal admittance matrix	374				
Nodal current	273				
Nodal voltage	273				
Noise	39	45	56	143	172
	186				
audible	143	172	187		

Index Terms

Links

Noise (*Cont.*)

bandwidth	41	43	44
chokes (telephone)	186		
interference	173		
mitigation techniques	186		
neutralizing transformer	186		
Nominal PI model	270	277	281
cascading	269		
Norton equivalent	368		
Notching	11		
Nyquist frequency	33		

O

Observability	366	389
Odd functions	20	
Orthogonal functions	19	52
Overcurrent protection	170	
Overlap	95	113

P

Parallel resonance	280	320	323	326
Periodic function	18			
Phase admittance matrix	295			
Phase angle control (<i>see</i> Firing angle)				
Phase locked oscillator	111	141		
Phase modulated harmonic series	134			
Phase spectrum	28			
Picket fence	40			
Piecewise continuous function	19			
Poincare	356			

Index Terms

Links

Point of common coupling	2	261	303		
Pole pitch	67				
Positive sequence	267	290	295	302	311
	314	321	323	335	339
	347				
Positive sequence impedance loci	323				
Potential coefficient	283	284			
Power, apparent	157				
d.c.	168				
distortion	161				
factor	145	156			
flow	360				
measurement	168				
reactive	156	295	298	299	
spectrum	43	44			
Power system harmonic filters admittance	222	231			
ageing	221				
automatically tuned	234	235			
capacitors	246				
conductance	232	237			
cost and cost optimization	249				
C-type	236	244			
damped	220	224	235		
detuning	221	246			
high pass	220	225	235	242	
impedance loci	228				
inductors	247				
manufacturing tolerances	221	235			
nominal tuned frequency	221				
power loss	234	246	247	248	
relative frequency deviation	229				

Index Terms

Links

Power system harmonic filters admittance (<i>Cont.</i>)					
second order	220	225	236		
shunt	219	243			
single tuned	220	228	233	248	
temperature effects	221	235	238	246	
third order	236	238			
tuned	219	220			
Primitive admittance matrix	282				
Protection	170				
Differential	171				
Distance	170				
Overcurrent	170				
Proximity effect	153				
PSCAD	375	376			
Psophometric weighting	178	179	182		
Pulse width modulation (PWM)	10	62	116	123	126

Q

Quality (<i>Q</i>) factor	145	221	229	232	252
	255				
Quarter wavelength transmission line	278	280	311	329	332

R

Railway systems	82				
Rational function	374	376			
Reactive power	221	234	235	242	246
	247	295	298	299	
Rectangular function	28	43			
Rectangular window function	38	41	43		

Index Terms

Links

Rectifier, controlled	104	120			
full (double)-wave	86				
half-controlled	104	105			
half-wave	86				
line commutated	82				
single phase	61				
six-pulse	88				
three-phase	88				
uncontrolled	75				
Reflected (backward) travelling wave	316				
Remnant (residual) flux	65				
Resonance	143	223			
complementary	147				
composite	147				
parallel resonance	143	226	235	244	280
	320	323	326		
series resonance	144	280	320	323	
transmission line	280				
Ripple	102	107	112		
ratio	102				
Ripple control	146	169	346		
Rotating machine, flux	67				
harmonic effects	149				
harmonic torques	151				
heating	149				
MMF distribution and harmonics	67				
power loss	150				
shaft torsional vibration	152				
slot harmonics	69				
three-phase winding	68				
Rotating vector	23				

Index Terms

Links

S

Sampled frequency spectrum	39				
Sampled functions	30				
Sampling frequency	34	55			
Sampling period	25	40	43	45	47
Sampling theorem	34				
Screening (shielding)	177				
Selectivity (filter)	169				
Self-admittance	262	295	296		
Series active filter	256	257			
Series admittance	297				
Series impedance matrix	269	273	276	280	285
	297	327			
Series resonance	280	320	323		
Shunt active filter	257				
Short-circuit rating	144				
Shunt admittance	335				
matrix	269	273	276	280	284
	297				
Sidelobes	29	39	44		
Signal conditioning	204				
Signal-to-noise ratio	172				
Sinc (sin x/x) function	29				
Skewing	72				
Skin effect	150	170	279	284	285
	290	291	295	302	314
ratio	286				
Slip	151				
Slot harmonics	69				
Sparsity	263				

<u>Index Terms</u>	<u>Links</u>				
Spectral density function	27				
Spectral leakage	29	41	43	45	
reduction	41	44			
Spectrum					
amplitude	28				
frequency	17	22	30	35	37
phase	28				
power	44				
sampled frequency	30				
Spectrum analyser	41	204			
Standards	5	9	154	170	178
	191				
Standby generators	71				
Standing waves	332	336			
State estimation	365				
State variable	354				
Static converters (<i>see also</i> Converter)	61				
Storage	204				
Stray capacitance	152	173			
Sub-harmonics	194				
Sub-transient reactance	295				
Susceptiveness	173				
SVC (Static VAR Compensator)	126				
Switching functions	135				
Symmetrical component transformation	317				
Symmetrical (sequence) components	316				
positive sequence	267	290	302	314	335
	347				
negative sequence	120	267	302	313	325
zero	120	264	311	318	339
	344				

<u>Index Terms</u>	<u>Links</u>				
Synchronised tests	210				
Synchronous machine	295				
flux	67				
harmonics	67	70			
sub-transient reactance	295				
System admittance matrix	225				
T					
TCSC (Thyristor controlled series compensation)	129				
Telephones and telephone systems	172				
balance	174	184			
equivalent circuit	173				
form factor (TFF)	179				
I.T product	182				
TDD (Total Demand Distortion)	11				
Television sets	80	81			
THD (Total Harmonic Distortion)	11	152	183		
Three-phase a.c./d.c. power flow	360				
Three-phase impedance loci	324				
Thyristor	85				
GTO (Gate Turn Off)	117	119			
Time harmonics	73	140			
Time domain	17	24	30	38	88
	91	92	353	355	357
	369				
Traction systems	82				
Transfer function	351				
Transformation matrix	317				
Transform decomposition	51				
Transformer admittance matrix	291				

Index Terms

Links

Transformer admittance	295			
connections	91	292	319	
converter	64	91		
copper loss	153			
current	196			
d.c. magnetization	65			
eddy currents	150			
flux	62			
harmonics	64	66		
hysteresis	62			
impedance loci	319			
inrush current	64			
leakage admittance	293			
leakage reactance	62			
magnetic non-linearity	62			
magnetization characteristic	63			
magnetizing current	63			
measurement	196			
noise neutralizing	186			
overexcitation	63			
phase shift	91			
residual flux	64			
saturation	64			
single phase	62			
tertiary winding	291			
unconventional current	196			
unconventional voltage	200			
winding resistance effect	65			
Transmission lines				
admittance matrix	273	283		
asymmetry	262	323	326	331

Index Terms

Links

Transformer admittance (*Cont.*)

attenuation	279	330	331
attenuation constant	280		
capacitance matrix	273		
characteristic impedance	279		
conductor impedance	284		
damping	280		
distributed parameters	278		
double circuit	314		
electromagnetic coupling	273		
electrostatic coupling	273		
equivalent PI	277		
geometric impedance matrix	283		
ground(earth) return model	270		
half-wavelength	279		
long lines	277		
losses	153		
multiconductor	281	331	
multiconductor equivalent PI	281		
mutual impedance	272		
mutually coupled	273		
negative resistance	279		
nominal PI	270		
open-circuited	280	312	
parallel	277		
phase constant	280		
potential coefficients	272		
propagation constant	278		
quarter wavelength	279		
resonance	280		
series impedance matrix	281		

<u>Index Terms</u>	<u>Links</u>				
Transformer admittance (<i>Cont.</i>)					
series reactance	279				
series resistance	279				
short-circuited	313				
shunt admittance	281				
shunt reactance	279				
shunt resistance	279				
single-phase	269				
skin effect	286				
standing waves	332	336			
termination	276				
three-phase	281				
transpositions	326	327			
travelling waves	316				
wave propagation	278				
Transmission loss	153				
Transmission (ABCD) parameters	265				
Transpositions	326	327			
Transverse voltage	177				
Travelling wave	316				
Triangular window function	41				
Triplen harmonics	63				
Tubular conductor	288				
Tuned stopper (blocking circuit)	146				
Two-port network	265				
U					
Unbalanced systems	262	299	313	322	325
	339				
Unbalanced voltages	107				
Uncharacteristic harmonics	105	109	326		

Index Terms

Links

Unconventional current transformers

active	197
Faraday effect	197
Hall effect	197
microwave	197
passive	197
Rogowski coils	197
search coils	196

Unconventional voltage transformers

electrogyration effect	200
electro-optical effect	200
Kerr effect	200

User interface	204
----------------	-----

V

VAR measurements	169		
VAR compensation (effect of)	334		
Voltage asymmetry (effect of)	106		
Voltage distortion (effect of)	79	105	107
Voltage divider	199		
capacitive	199		
Voltage Source Converter	116		
Voltage transducers	217		
Voltage transformer	191		
capacitor	198		
magnetic	197		
unconventional	200		

W

Walsh Transform	52
-----------------	----

<u>Index Terms</u>	<u>Links</u>				
Waveform symmetry					
even	21				
half-wave	21				
odd	20				
Wavelength	269	278	279	311	316
	329	332	334		
Wavelet Transform	53				
Wave propagation	278				
Weighting	178				
C-message	178				
psophometric	178				
Weighted Least Squares	375				
Window functions,					
Dolph-Chebyshev	44				
Gaussian	44				
Hamming	43				
Hanning	43				
rectangular	26	28	38	41	43
triangular	41				

Z

Zero sequence	120	264	311	312	314
	318	339	344	345	346