
Index of Graphs

- anti-line graph, 465
- $B(k, m, n)$ – A Bower graph, 451
- block quotient digraph, 113
- Bower graph, 451
- $B(\text{PG}(d-1, q))$ – the point-hyperplane incidence graph of \mathbb{F}_q^d , 160
- Cayley digraph, 11
- Cayley graph
 - arc-transitive, 93
- circulant, 13
 - 2-arc-transitive, 353
 - arc-transitive, 352
 - automorphism group, 346–349
 - isomorphisms, 303–317
 - unitary, 130, 164
- clique graph, 191, 229
- complement
 - of $K(n, 2)$, 226
 - of the line graph of K_n , 223
- Coxeter graph, 215
 - 3-arc-regular, 217
 - automorphism group, 217
 - F28, 215
 - not Cayley, 268
 - not Hamiltonian, 219, 405
 - truncation, 222
 - truncation of the truncation, 107
- cube, 1
 - 2-arc regular, 128
 - as a Cayley graph of \mathbb{Z}_2^3 , 12
 - automorphism group, 1–3, 255
 - cover of K_4 , 201
 - distance-transitive, 449
 - is F8, 11
 - is Hamming graph $H(2, 3)$, 189
 - normal Cayley graph, 327
 - truncation of, 129
- deleted wreath product, 349–351
- Desargues graph
 - as Levi graph, 240
 - automorphism group, 256
 - distance-transitive, 449
 - F20B, 11, 240
 - is $\text{GP}(10, 3)$, 256
 - type $\{1, 2^1, 2^2, 3\}$, 385
- $D_G(\Gamma)$ – a natural orientation of the half-arc-transitive graph Γ , 453
- dodecahedron, 39
 - 2-arc-regular, 128
 - as orbital graph, 78
 - distance-transitive, 449
 - is $\text{GP}(10, 2)$, 256
 - is F20A, 11
 - vertex-transitive, 39
- double coset digraph, 21
- Doyle–Holt graph, *see* Holt graph
- F10, *see* Peterson graph
- F14, *see* Heawood graph
- F16, *see* Möbius–Kantor graph
- F18, *see* Pappus graph
- F20A, *see* dodecahedron
- F20B, *see* Desargues graph
- F24, *see* Nauru graph
- F28, *see* Coxeter graph
- F4, is K_4 , 11
- F48, *see* $\text{GP}(24, 5)$
- F432E, 452

498

Index of Graphs

- F8, *see* cube
 Fermat digraph, 265
 Fermat graph, 262–268
 Hamiltonian, 417
 not metacirculant, 367
 order qp , 371
 folded Johnson graph, 232
 automorphism group, 232
 Cayley, 236
 Folkman graph, 462
- generalized
 Cayley graph, 442
 Folkman graph, 463
 Petersen graph, 248–261
 GP(4, 1), *see* cube
 GP(5, 2), *see* Petersen graph
 GP(8, 3), *see* Möbius–Kantor graph
 GP(10, 2), *see* dodecahedron
 GP(10, 4), 248
 GP(24, 5), 256
 automorphism group, 256
 Cayley graph of $GL(2, 3)$, 258
 is 2-arc-regular, 256
 is F48, 256
 Grassman graph, 237
- Haar graph, 377
 Hamming graph $H(d, n)$, 189
 Heawood graph, 35
 4-arc regular, 162
 automorphism group, 158–163
 distance-transitive, 449
 F14, 35
 Levi graph of Fano plane, 240
 metacirculant, 35
 not normal Cayley graph of D_{14} , 324
 type $\{1, 4^1\}$, 385
 usual drawing, 158
 hexagon graph, 427
 Holt graph, 99
 alternating cycles, 454
 half-arc-transitive, 99
- I-graph, 261
 icosahedron, 39
 1-arc-regular, 128
 as an orbital graph, 76
 vertex-transitive, 40
 intersection graph, 74
- J(5,2), *see* Petersen graph
 Johnson graph, 226–237
 automorphism group, 230
 Cayley, 236
- K_n , the complete graph of order n , 9
 2-arc-regular, 128
 $K(5, 2)$, *see* Petersen graph
 Kneser graph, 223–224
- Levi graph, 160, 237–248
 line graph of Petersen graph, 61
- (m, n) -metacirculant digraph, 35
 Möbius–Kantor graph, 269
 automorphism group, 255
 consistent cycles of, 384
 F16, 255
 is GP(8, 3), 255
 Levi graph, 269
 Marušič–Scapellato graph,
 see Fermat graph
- Nauru graph
 automorphism group, 256
 is GP(12, 5), 256
 n -cube, *see* Q_n
- O_2 , *see* Petersen graph
 octahedron, 39
 1-arc-regular, 128
 Cayley graph, 41
 odd graph, 225
- Pappus graph, 406
 distance-transitive, 449
 F18, 207
 is Hamiltonian, 406
 Levi graph, 269
 type $\{1, 2^1, 2^2, 3\}$, 385
 Petersen graph, 9, 46–48, 226
 2-subset labeling, 47
 3-arc-regular, 88
 arc-transitive, 82
 as a (2, 5)-metacirculant graph, 35
 as a double coset graph, 23
 as a generalized orbital graph of a
 metacyclic group, 29
 as an orbital graph of S_5 , 30
 automorphism group, 48, 91
 distance-transitive, 449

Index of Graphs

499

- edge cyclic connectivity, 426
- Frucht notation, 122
- is F10, 11
- is GP(5, 2), 248
- is $K(5, 2)$, 223
- is odd graph O_2 , 225
- line graph, 61
- metacirculant labeling, 35
- not Cayley, 18
- not Hamiltonian, 103, 404, 405
- primitive automorphism group, 60
- truncation, 104
- truncation not Cayley, 129
- truncation of the truncation, 107
- type $\{2^1, 3\}$, 394
- vertex-transitive, 9
- point-line incidence graph of a configuration, 239
- Q_n , 9
 - automorphism group, 211
 - Cayley graph, 41
 - is $H(n, 2)$, 189
 - normal Cayley graph, 327
 - the n -dimensional hypercube or n -cube, 9
 - quotient digraph, 113
- rose window graph, 261, 398
- Θ_2 – the Theta graph, 382
- truncation of a cubic graph, 104
- unitary circulant graph, 130, 164

Index of Symbols

- $[1, n]$ – the first n positive integers, 30
- $A(\Gamma)$ – the arc set of a digraph, 7
- A_n – the alternating group on n letters, 5
- $\tilde{\alpha}$ – the induced action of $\alpha \in \text{Aut}(G)$ on G/H , 155
- $\text{AG}(d, n)$ – the affine geometry of dimension d over the field of order n , 125
- $\text{AG}(d, \mathbb{F})$ – the affine geometry of dimension d over the field \mathbb{F} , 125
- $\text{AGL}(1, p)$ – the affine general linear group of dimension 1 over \mathbb{F}_p , 26
- $\text{AGL}(d, p)$ – the affine general linear group of dimension d over \mathbb{F}_p , 85
- $\text{AGL}(d, \mathbb{F})$ – affine general linear group of dimension d over \mathbb{F} , 126
- $A(n, k)$ – $\text{Aut}(\text{GP}(n, k))$, 249
- $\text{Aut}(G)$ – the automorphism group of the group G , 8, 15
- $\text{Aut}(\Gamma)$ – the automorphism group of the color digraph Γ , 174
- $\text{Aut}(C)$ – the automorphism group of the configuration C , 242
- $\text{Aut}(D)$ – the automorphism group of the design D , 245
- $\text{Aut}(G, H, S)$ – the set of all automorphisms of G that fix both H and HS , 156
- $\text{Aut}(G, S)$ – the set of automorphisms of G that fix S , 156
- $\text{Aut}(W)$ – the automorphism group of the color k -ary relational structure W , 297
- $\text{Aut}(X)$ – the automorphism group of the k -ary relational structure X , 297
- $\text{Aut}(\Gamma)$ – the automorphism group of the digraph Γ , 8
- $B(\text{PG}(d-1, q))$ – the point-hyperplane incidence graph of \mathbb{F}_q^d , 160
- $B(k, m, n)$ – A Bouwer graph, 451
- $B(n, k)$ – a subgroup of $\text{Aut}(\text{GP}(n, k))$, 249
- $\mathcal{B} \leq C - \mathcal{B}$ is a refinement of C , 53
- C/\mathcal{B} – the block system of G/\mathcal{B} induced by C , 183
- $C(n, k)$ – the clique graph of the Johnson graph $J(n, k)$, 229
- $\text{CT}(\varphi)$ – the groups of covering transformations, 204
- $\text{Cay}(G, S)$ – the Cayley digraph with connection set S , 11
- $\text{Cl}_G(g)$ – the conjugacy class of g in G , 439
- $\text{CM}(g, s, \rho)$ – the Cayley map of G with respect to S and ρ , 397
- $\text{core}_G(H)$ – the core of H in G , 24
- $\text{Cos}(G, H, S)$ – the double coset digraph of G with stabilizer H and connection set S , 21
- $\text{Cov}(\Gamma)$ – a cover of Γ , 201
- $d(A, B)$ – the valency of $\Gamma[A, B]$, 406
- D_{2n} – the dihedral group of order $2n$, 13
- $D_G(\Gamma)$ – a natural orientation of the half-arc-transitive graph Γ , 453
- $\text{distr}(u, v)$ – the distance in the graph Γ between the vertices u and v , 170
- DRR – digraphical regular representation, 176
- $E(\Gamma)$ – the edge set of a graph, 7
- fib_v – the vertex fiber of a regular covering projection corresponding to v , 199

Index of Symbols

- Fix(g) – the fixed points of the permutation g , 124
- $\text{fix}_G(\mathcal{B})$ – the fixer of \mathcal{B} in G , 52
- $\text{fix}_G(\mathcal{B})|_C$ – the restriction of $\text{fix}_G(\mathcal{B})$ to C , 181
- $(G, G/H)$ – the image of the permutation representation of G induced by the left coset action of G on G/H , 19
- (G, s) -arc-transitive, 116
- $G(x)$ – the orbit of x in G , 6
- G/\mathcal{B} – permutation group induced by the action of G on \mathcal{B} , 52
- G/H – the set of left cosets of G in H , 19
- $G \times H$ – the direct product of groups G and H , 33
- $G \wr H$ – the wreath product of two groups, 143
- $G^{(2)}$ – the 2-closure of G , 175
- G^O – the transitive constituent of G on O , 30
- $G^{(k)}$ – the k -closure of G , 297
- G^H – the normal closure of H in G , 337
- G_L – the left regular representation of a group G , 13
- G_R – the right regular representation of the group G , 14
- $g|_C$ – the restriction of g to C , 181
- g^B – the permutation on B induced by g , 30
- g^O – the permutation on the orbit O of g induced by g , 30
- g_L – left translation by g , 13
- \hat{g}_L – the permutation of G/H defined by left multiplication of the left cosets of G/H by g , 95
- Γ/K – quotient multigraph corresponding to the subgroup K , 406
- Γ/ρ – quotient multigraph corresponding to orbits of the subgroup generated by ρ , 406
- Γ/\mathcal{B} – the block quotient digraph of Γ with respect to \mathcal{B} , 113
- Γ/\mathcal{P} – the quotient digraph of Γ with respect to a partition \mathcal{P} , 113
- $\Gamma[B, B']$ – the bipartite subgroup of Γ induced by B and B' , 131
- $\Gamma[X]$ – the subgraph of Γ induced by X , 100
- $\Gamma \square \Delta$ – the Cartesian product of the graphs Γ and Δ , 110, 191
- $\Gamma_1[\Gamma_2]$ – the lexicographic (wreath) product of two digraphs, 142
- $\Gamma_1 \wr \Gamma_2$ – the wreath product of two digraphs, 141
- $\Gamma_1 \wr_d \Gamma_2$ – the deleted wreath product of two digraphs, 349
- $\Gamma L(d, q)$ – the general semilinear group of dimension d over the field \mathbb{F}_q , 195
- $GL(d, \mathbb{F})$ – the general linear group of dimension d over the field \mathbb{F} , 126
- $\text{gcd}(m, n)$ – greatest common denominator of m and n , 7
- $GP(n, k)$ – generalized Petersen graph, 248
- GRR – graphical regular representation, 176
- $H \trianglelefteq G - H$ is a normal subgroup of G , 41
- Haar(G, S) – the Haar graph of G with connection set (S) , 377
- Hex(Γ) – the hexagon graph of Γ , 427
- Hol(G) – the holomorph of G , 156
- I – inside vertices of $GP(n, k)$, 249
- Inn(G) – the inner automorphisms of G , 134
- $I(\Gamma)$ – the set of involutions in $\text{Aut}(\Gamma)$ that fix a vertex, 388
- $\tilde{J}(2k, k)$ – a folded Johnson graph, 232
- $J(n, k)$ – a Johnson graph, 226
- K_n – the complete graph on n vertices, 9
- $\mathbf{k}(\Delta)$ – the key of the partition Δ , 315
- $K(n, k)$ – a Kneser graph, 223
- \mathbf{K}_{p^n} – a primary key space, 304, 315
- $\text{Ker}(\phi)$ – the kernel of the homomorphism ϕ , 4
- ℓ_S – the last element in a sequence, 409
- $\text{lcm}(m, n)$ – least common multiple of m and n , 32
- $(m, n, \alpha, S_0, \dots, S_{m-1})$ – metacirculant digraph, 34
- $m\Gamma$ – the union of m vertex-disjoint graphs isomorphic to Γ , 76
- $N \rtimes H$ – the internal semidirect product of H and N , 32
- $N \rtimes_{\phi} H$ – the external semidirect product of N and H , 44
- $N^+(u)$ – the outneighbors of u in Γ , 8
- $N_G(H)$ – the normalizer of H in G , 43
- $N_{\Gamma}(u)$ – the neighbors in Γ of u , 8
- $N_{\Gamma}^+(u)$ – the outneighbors of u in Γ , 8
- $N_{\Gamma}^-(u)$ – the inneighbors of u in Γ , 8

- $O(f(x))$ – Big O of $f(x)$, 273
 O_k – an odd graph, 224
 O – the outside vertices of $GP(n, k)$, 249
 $\Omega(n)$ – the number of prime divisor of n with repetition, 300
 (p_q, d_k) -configuration, 239
 $P(\mathbf{k})$ – the solving set of a circulant with key \mathbf{k} , 314, 316
 $P \vee Q$ – the join of the partitions P and Q , 311
 $PG(d-1, q)$ – the projective geometry of dimension $d-1$ over \mathbb{F}_q , 160
 $PGL(d, q)$ – the projective general linear group of dimension d over the field \mathbb{F}_q , 85, 160
 $P\Gamma L(d, q)$ – the projective semilinear group of dimension d over \mathbb{F}_q , 195
 φ – Euler’s phi function, 165
 φ_N – an N -covering projection, 199
 $\Pi(\Gamma, b)$ – the set of all closed walks in Γ that contain b , 204
 π -group, 280
 $\pi_i(\mathcal{S})$ – the i th partial product of the sequence \mathcal{S} , 409
 $Pl(\Gamma)$ – the partial line graph of Γ , 458
 $PSL(d, q)$ – the projective special linear group of dimension d over \mathbb{F}_q , 194
 $[q, k]$ -configuration, 239
 Q_8 – the quaternion group, 40
 Q_n – the n -dimensional hypercube or n -cube, 9
 QD_{2^n} – the quasi-dihedral group of order 2^n , 379
 $R_n(a, r)$ – a rose window graph, 398
 $[R, S, T]$ – a symbol of a bicirculant graph, 368
 $(\mathcal{S}, \mathcal{T})$ – a combination of the two sequences \mathcal{S} and \mathcal{T} , 409
 \bar{S} – the sequence $[s_1, s_2, \dots, s_{r-1}]$, 409
 \hat{S} – the sequence $[s_2, s_3, \dots, s_r]$, 409
 S_n – the symmetric group on n letters, 4
 $S(\Gamma)$ – the set of all semiregular involutions in $\text{Aut}(\Gamma)$, 388
 S^\perp – the orthogonal complement of S , 159
 $SL(d, q)$ – the special linear group of dimension d over \mathbb{F}_q , 194
 $\Sigma(\mathbf{k})$ – the primary key partition corresponding to \mathbf{k} , 306, 315
 $\text{soc}(G)$ – the socle of G , 157
 $\text{Stab}_G(B)$ – the stabilizer of the block B in G , 55
 $\text{Stab}_G(B)^B$ – the transitive constituent of $\text{Stab}_G(B)$, 30
 $\text{Stab}_G(x)$ – the stabilizer of x in G , 5
 $T(\Gamma)$ – the truncation of a cubic graph Γ , 104
 $T(n)$ – a triangular graph, 226
 $\phi(\Gamma)$ – the image of Γ under a bijection, 8
 Θ_2 – the Theta graph, 382
 $\cup_{i=1}^r \Gamma_i$ – the union of the digraphs $\Gamma_1, \dots, \Gamma_r$, 27
 $\mathbf{u} \wedge \mathbf{v}$ – the meet of two vectors, 311
 (v_1, \dots, v_r, v_1) – a directed cycle, 78
 $\lfloor x \rfloor$ – the greatest integer less than or equal to x , 38
 X/G – the set of orbits of X acting on G , 124
 $Z(G)$ – the center of the group G , 53
 \mathbb{Z}_n – the integers modulo n , 4
 \mathbb{Z}_n^* – the group of units in \mathbb{Z}_n^* , 4
 $\mathbb{Z}_n^{**}(\mathbf{k})$ – the set of genuine generalized multipliers corresponding to the key \mathfrak{T} , 310
 \mathbb{Z}_n^{**} – the set of generalized multipliers, 308, 315

Select Author Index

- Ádám, András, 274
 Alspach, Brian, 31, 37, 99, 121, 154, 237,
 261, 277, 284, 294, 353, 358

 Babai, László, 103, 176, 272, 273, 277, 278,
 280, 281, 283, 284, 285, 322, 323,
 325, 402
 Baik, Young-Gheul, 325, 328
 Bamberg, John, 328
 Bays, S., 276
 Beaumont, Ross Allen, 232, 233, 235
 Biggs, Norman, 218, 225, 384, 449
 Boben, Marko, 260, 261
 Bollobás, Béla, 8
 Bondy, Adrian, 261
 Boreham, Timothy George, 262
 Bouwer, Izak Z., 99, 262, 378, 451, 452,
 464, 465
 Burnside, William, 124, 153, 187, 331, 446

 Cameron, Peter, 197, 274, 396
 Castagna, Frank, 248
 Chao, Chong-yun, 191
 Chen, Chuan Chong, 112
 Chen, Ya-Chen, 224
 Chernoff, William W., 378
 Conder, Marston, 11, 38, 92, 243, 353, 378,
 380, 452, 465
 Conway, John Horton, 215, 384
 Coxeter, Harold Scott MacDonald, 215, 238,
 248, 257, 258

 Djoković, Dragomir Ž., 92, 379
 Dobscányi, Peter, 92, 378
 Dobson, Ted, 158, 168, 301, 303, 373
 Donovan, Elizabeth, 231

 Doyle, Peter G., 99
 Du, Shaofei, 421

 Eiben, Eduard, 109
 Elspas, Bernard, 274, 275, 315
 Erdős, Paul, 3, 223
 Estélyi, István, 243
 Evdokimov, S. A., 346

 Fein, Burton, 127, 437
 Feng, Yanquan, 38, 76, 325, 328, 384
 Folkman, Jon, 462
 Foster, Ronald, 11, 215, 378
 Frankl, Peter, 281, 283, 285
 Frucht, Roberto, 122, 249, 256, 262, 378, 452

 Gallai, Tibor, 401
 Gardiner, Anthony, 396
 Giudici, Michael, 328, 447, 448
 Glover, Henry, 424
 Godsil, Chris, 156, 176, 224, 232, 295, 322,
 323, 325
 Goldschmidt, David M., 92
 Grünbaum, Branko, 239
 Graver, Jack, 249
 Gray, Marion C., 465
 Gross, Fletcher, 204, 280
 Guralnick, Robert M., 343

 Harary, Frank, 141, 147, 168
 Hassani, Akbar, 372
 Hell, Pavol, 285
 Higman, Donald, 63
 Holt, Derek, 99, 284, 456
 Holtan, Derek, 468
 Hua, Xiao-Hui, 76
 Hujdurović, Ademir, 381

504

Select Author Index

- Imrich, Wilfried, 322
 Iranmanesh, Mohammad, 372
- Jaeger, Françoise, 425
 Jajcay, Robert, 109
 Johnson, Selmer, 226
 Jones, Gareth A., 157, 194
 Jordan, Camille, 437
 Joseph, Anne, 359
- Kalužnin, Lev Arkadjevič, 145, 149, 177
 Kantor, William M., 127, 247, 437
 Kirkpatrick, David, 285
 Klin, Mikhail, 177, 272, 294
 Kneser, Martin, 223
 Kotlov, Andrew, 169
 Kovács, István, 262, 347, 351, 359
 Kowalewski, A., 47, 225
 Krasner, Marc, 149
 Krivelevich, Michael, 421
 Kutnar, Klavdija, 262, 381, 421, 449
- Lee, Jaeun, 76
 Leung, Ka Hin, 346
 Levi, Friedrich Wilhelm, 238
 Li, Cai-Heng, 38, 157, 158, 187, 194, 196,
 197, 280, 283, 287, 347, 351, 372
 Liebeck, Martin W., 187, 197, 371
 Livingstone, David, 224
 Lambossy, P., 276
 Lorimer, Peter, 118
 Lovász, László, 88, 102, 110, 169, 223,
 322, 401
 Lovrečič Saražin, Marko, 257
 Luks, Eugene, 274
- Malnič, Aleksander, 465
 Man, Shing Hing, 346
 Marušič, Dragan, 38, 87, 99, 123, 124, 262,
 266, 268, 353, 361, 373, 381, 421,
 443, 465
 McKay, Brendan D., 124, 361
 Miller, Gary Lee, 92, 379
 Miller, George Abram, 6
 Miller, Robert C., 384
 Mohar, Bojan, 405
 Monson, Barry, 378
 Morris, Dave Witte, 157, 412, 413, 421
 Morris, Joy, 168, 323, 325, 359
 Morton, Margaret, 378
 Müller, Peter, 469
- Mütze, Torsten, 225
 Muzychuk, Mikhail, 272, 285, 300, 303
- Nedela, Roman, 92, 257, 380, 384, 425, 429
 Negami, Seiya, 384
 Nowitz, Lewis, 99, 176, 285
 Nummenpalo, Jerri, 225
- Pak, Igor, 401, 421, 422
 Pálffy, Peter P., 272, 286, 296, 298, 299, 302
 Parsons, Torrence, 31, 37, 121, 277, 284,
 294, 358
 Payan, Charles, 425, 426
 Pelikán, József, 110, 410
 Peterson, Raymond P., 232, 233, 235
 Pisanski, Tomaž, 243, 260, 261
 Ponomarenko, Ilija, 346
 Pöschel, Reinhard, 272, 294
 Potočnik, Primož, 92, 102, 465
 Praeger, Cheryl E., 116, 187, 197, 267, 361,
 371, 372
 Prins, Gert, 248
- Quimpo, Norman K., 112
- Radoičić, Radoš, 401, 421, 422
 Ramos Rivera, Alejandra, 452, 461
 Ramras, Mark, 231
 Rapaport-Strasser, Elvira, 402
 Rényi, Alfréd, 3
 Royle, Gordon, 124, 284, 328, 405
- Sabidussi, Gert, 17, 22, 25, 152, 168, 169, 276
 Sakarovitch, Michel, 425, 426
 Saxl, Jan, 187, 197, 371
 Scapellato, Raffaele, 262, 266, 268
 Schacher, Murray, 127, 437
 Schur, Issai, 272
 Seress, Akos, 197, 287, 372
 Servatius, Mary, 359
 Sim, Hyo-Seob, 157, 325, 328
 Škoviera, Martin, 257, 425, 429
 Smith, Derek, 449
 Smith, Murray R., 328
 Somlai, Gábor, 285
 Song, Shu Jiao, 38, 187
 Šparl, Primož, 38, 109, 449, 452, 461
 Spiga, Pablo, 92, 102, 158, 285, 301, 323,
 325, 373
 Star, Z., 378
 Staton, William, 260

Select Author Index

505

- Steimle, Alice, 260
 Sudokov, Benny, 421
 Suprunenko, Dmitrii, 279
- Tan, Ngo Dac, 278
 Thomassen, Carsten, 103, 402
 Trofimov, Vladimir I., 395
 Turner, James, 153, 274, 275, 278, 315
 Tutte, William T., 88, 89, 91, 92, 98, 215,
 218, 381, 451
 Tyshkevich, Regina, 278
- Verret, Gabriel, 92, 102, 448
 Voss, Heinz-Jürgen, 401
- Wagner, Ascher, 224
 Walczak, Bartosz, 225
 Walther, Hansjoachim, 401
 Wang, Changqun, 325
 Wang, Dianjun, 38, 325
- Wang, Ru-Ji, 267, 371
 Watkins, Mark, 248, 249, 258
 Weiss, Richard, 395, 396, 399
 Whitney, Hassler, 46
 Wielandt, Helmut, 175, 177, 211, 296,
 469, 470
 Wilson, Steve, 92, 169, 261, 398
 Wong, Warren J., 394
- Xu, Jing, 447, 448
 Xu, Mingyao, 99, 267, 325,
 353, 371
- Yang, T.Y., 424
- Zhang, Hua, 187
 Zhang, Mi-Mi, 38
 Zhou, Jin-Xin, 38
 Žitnik, Arjana, 260, 261, 452
 Zsigmondy, Karl, 298

Index of Terms

- 1/2-transitive, 93
- 1/ k -consistent cycle, 392
- 2-closed group, 175
- 2-closure, 175
- 2-subset – a subset of size 2, 46
- 2-transitive group, 59
- $(2, s, t)$ -generated group, 396
- $(2, s, t)$ -presentation, 396

- action, 4
 - degree, 4
 - faithful, 4
 - kernel of, 4
 - left coset, 19
 - local, 129, 395
 - product, 191
- affine
 - general linear group of dimension 1 over \mathbb{F}_p , 26
 - general linear group of dimension d over \mathbb{F} , 126
 - general linear group of dimension d over \mathbb{F}_p , 85
 - geometry, 125
 - line, 125
 - subspace, 125
- almost
 - self-complementary graph, 280
 - simple group, 287
- α -admissible regular covering projection, 204
- α -rigid cell, 385
- alphabet, 273
- alternating
 - group, 5
 - cycle, 454

- alternet, 454
 - head set, 454
 - length, 454
 - tail set, 454
- anti-line graph, 464
- antipodal vertices of an even cycle, 78
- arc
 - fiber, 199
 - head of, 453
 - set of a digraph, 7
 - tail of, 453
- arc-transitive digraph, 8
- attachment number, 454
- attachment set, 454
- automorphism
 - even, 381
 - inner, 134
 - odd, 381
 - of a k -ary relational structure, 297
 - of a color k -ary relational structure, 297
 - of a color digraph, 174
 - of a combinatorial object, 276
 - of a configuration, 242
 - of a design, 245
 - of a digraph, 8
 - of a regular covering projection, 204
 - of an affine geometry, 127
 - outer, 134
 - quasi-semiregular, 450
 - shunt, 382
 - simplicial, 391
- automorphism group
 - of a color digraph, 174
 - of a k -ary relational structure, 297
 - of a color k -ary relational structure, 297
 - of a configuration, 242

- of a design, 245
- of a digraph, 8
- balanced digraph, 458
- base
 - graph, 199
 - vertex, 204
- basic lifting lemma, 204
- (\mathcal{B}, C) -generalized wreath product, 210
- bi-coset graph, 377
- \mathcal{B} -fixer block system of G , 184, 209
- bicirculant graph, 368
 - symbol, 368
- Big O notation, 273
- biquasiprimitive permutation group, 448
- block
 - of a permutation group, 49
 - conjugate, 49
 - trivial, 49
- block design, 243
- block quotient digraph, 113
 - normal, 116
- block system, 49
 - normal, 52
- block systems
 - orthogonal, 334
- Bouwer graph, 451
- Burnside group, 186
- Burnside's
 - $p - q$ theorem, 446
 - transfer theorem, 332
- canonical involution, 387
- Cartesian product
 - graph, 110, 191
 - of groups, 33
- Cayley
 - map, 397
 - number, 373
 - object, 276
- Cayley digraph, 11
 - metacirculant digraph, 37
 - normal, 323
- Cayley graph, 11
 - folded Johnson graph, 236
 - generalized Petersen graph, 257
 - Johnson graph, 236
 - Kneser graph, 224
 - metacirculant graph, 37
- center of a group, 53
- CFSG – the classification of the finite simple groups, 189
- CI-
 - (di)graph, 276
 - group, 278
 - group with respect to (di)graphs, 276
 - object, 276
- circulant digraph, 13
- claw, 69
- clique graph, 191, 229
- closure-odd group, 473
- coil of a cycle, 121
- color
 - k -ary relational structure, 297
 - digraph, 174
- combinatorial
 - object, 276
 - substructure, 67
- complete block system, 49
- composition of graphs, 142
- computational complexity of an algorithm, 273
- configuration, 238
 - Desargues, 239
 - Fano plane, 215
 - Möbius–Kantor, 270
 - Pappus, 270
- conjugacy class of $g \in G$, 439
- conjugate block, 49
- connected
 - configuration, 242
 - design, 246
- connection set
 - double coset digraph, 21
 - of a bi-coset graph, 377
 - of a Cayley digraph, 11
- consistent
 - oriented cycle, 382
 - walk, 382
- consistent cycle, 382
 - $(G, 1/k)$, 392
 - $1/k$, 392
- core of H in G , 24
- core-free subgroup, 24
- coset digraph, 22
- cover, 201
- covering graph, 199
- cube, 9
- cubic graph, 10
- cycle
 - alternating, 454
 - consistent, 382
- cyclot, 392

508

Index of Terms

- cyclic stability number, 425
- cyclically stable, 425
- cyclically k -edge-connected, 426

- Dedekind group, 83
- degree
 - of an action, 4
 - of a permutation group, 5
- deleted wreath product, 349
- derangement, 437
- derived graph, 201
- design
 - automorphism group, 245
 - connected, 246
 - symmetric, 244
 - with parameters k , r , and λ , 243
- digraph, 7
 - arc-transitive, 8
 - balanced, 458
 - block quotient, 113
 - Cayley, 11
 - circulant, 13
 - color, 174
 - double coset, 21
 - Fermat, 265
 - G -arc-transitive, 94
 - generalized Cayley, 442
 - generalized orbital, 27
 - isomorphism, 8
 - metacirculant, 34
 - normal block quotient, 116
 - orbital, 26
 - regular, 12
 - strongly connected, 15
 - union, 27
 - vertex-transitive, 8
 - weakly connected, 15
- digraphical regular representation, 176
- dihedral group, 13
- direct product of groups, 33
- distance-transitive graph, 449
- double coset
 - digraph, 21
 - (H, K) -, 42
 - of H in G , 21
- doubly-transitive group, 59
- Doyle–Holt graph, 99
- DRR, 176
- duad - a pair of oppositely oriented 5-cycles in the Petersen graph, 71

- duality
 - of a configuration, 242
 - of a design, 245

- edge, 7
 - cycle separating, 426
 - cyclic connectivity, 426
 - fiber, 199
 - inner, 249
 - outer, 249
 - set, 7
 - spoke, 249
- edge-transitive graph, 8
- elementary abelian group, 16
- elusive group, 123
- embedding theorem, 149
- equivalent
 - permutation representations of G , 135
 - regular covering projections, 203
- Euler's phi function, 165
- even
 - automorphism, 381
 - permutation, 5
 - permutation group, 381, 472
- external semidirect product, 44

- faithful action, 4
- Fano plane, 163
- Fermat digraph, 265
- fibers, 199
- fixer of \mathcal{B} in G , 52
- folded Johnson graph, 232
- Foster census, 11
- function composition, 8
- fundamental closed walk, 204

- $(G, 1/k)$ -consistent cycle, 392
- (G, s) -arc-transitive, 116
- G -admissible regular covering projection, 204
- G -alternating cycle, 454
- G -alternet, 454
 - head set, 454
 - length, 454
 - tail set, 454
- G -antipodally attached, 461
- G -arc-transitive digraph, 94
- G -attachment set, 454
- G -attachment number, 454
- G -congruence, 54
- G -edge-transitive graph, 94
- G -half-arc-transitive, 94

- G*-invariant partition of X , 49
G-loosely attached, 454
G-radius, 454
G-tightly attached, 454
 GAP, 77
 general
 linear group, 126
 semilinear group, 195
 generalized
 Cayley digraph, 442
 dicyclic group, 176
 Folkman graph, 462
 orbital digraph, 27
 Petersen graph, 248
 wreath product, 179
 generalized multiplier, 307
 genuine, 315
 primary genuine, 310
 generated
 block system, 58
 graph, 7
 almost self-complementary, 280
 anti-line, 465
 base, 199
 bicirculant, 368
 Bouwer, 451
 Cartesian product, 110, 191
 Cayley, 11
 circulant, 13
 clique, 191
 complete, 9
 composition, 142
 covering, 199
 Coxeter, 214–223
 cubic, 10
 cyclically stable, 425
 derived, 201
 distance-transitive, 449
 Doyle–Holt, 99
 edge cyclic connectivity, 426
 edge transitive, 8
 Fermat, 262
 folded Johnson, 232
 generalized Folkman, 462
 G-edge-transitive, 94
 Grassman, 237
 Haar, 377
 half-arc-transitive, 92
 Hamming, 189
 Heawood, 35
 hexagon, 427
 Holt, 99
 homogeneous factorization, 280
 homomorphism, 198
 I-graphs, 261
 intersection, 74
 irreducible, 169
 Johnson, 226
 Kneser, 223
 Levi, 160, 239, 245
 local action, 395
 Marušič–Scapellato, 262
 Möbius–Kantor, 269
 odd, 225
 orbital, 30
 orientation, 70
 Pappus, 269
 partial line, 458
 point-hyperplane incidence, 160
 point-line incidence, 239
 quartic, 92
 quintic, 447
 reducible, 169
 rose window, 261, 398
 self-complementary, 280
 semisymmetric, 462
 strongly regular, 470
 symmetric, 10
 tetrahedral, 226
 triangular, 226
 truncation, 104
 unitary circulant, 130
 unworthy, 169
 worthy, 169
 graphical regular representation, 176
 greatest common denominator, 7
 greatest integer function $\lfloor x \rfloor$, 38
 group
 $(2, s, t)$ -generated, 396
 2-transitive, 59
 affine general line, 26, 126
 affine general linear group of dimension d
 over \mathbb{F}_p , 85
 almost simple, 287
 alternating, 5
 Burnside, 186
 center, 53
 closure-odd, 473
 Dedekind, 83
 dihedral, 13
 elementary abelian, 16
 elusive, 123

- group (cont.)
 even, 472
 general linear, 126
 general semilinear, 195
 generalized dicyclic, 176
 Hamiltonian, 83
 imprimitive, 49
 k -closed, 297
 k -transitive, 84
 local action, 395
 metacyclic, 38
 odd, 472
 of covering transformations, 204
 of symmetries of a configuration, 241
 of symmetries of a design, 245
 orbital-odd, 473
 permutation, 4
 primitive, 49
 projective general linear, 85, 159
 projective special linear, 194
 quasi-dihedral, 379
 quasiprimitive, 61
 quaternion, 40
 rank of, 28
 regular, 7
 semiregular, 7
 simply primitive, 60
 socle, 157
 special linear, 194
 symmetric, 4
 transitive permutation, 5
 wreath product, 143
 zero-odd, 473
 GRR, 176
- (H, K) -double coset, 42
 Haar graph, 377
 half-arc-transitive graph, 92
 Hall π -subgroup, 280
 Hamilton
 connected, 112
 laceable, 112
 Hamiltonian group, 83
 Hamiltonian sequence, 409
 Hamming graph, 189
 head
 of an arc, 453
 set of a G -alternet, 454
 Heawood graph, 35
 Higman's theorem, 63
 holomorph of G , 156
- Holt graph, 99
 homogeneous
 factorization of a graph, 280
 group, 233
 homomorphism of graphs, 198
 hypercube, 9
 hypergraph, 402
 hyperplane in \mathbb{F}_q^d , 159
 hypo-Hamiltonian, 261
- imprimitive group, 49
 in adjacent, 179
 incidence relation, 238
 induced
 action on a block system, 52
 block system, 183
 partition, 313
 inequivalent permutation representations, 139
 S_6 , 140
 inner automorphism, 134
 inner edge, 249
 inside vertices, 249
 internal semidirect product, 32
 intersection graph, 74
 invalence, 39
 invalency of a regular digraph, 12
 involution - an element of order 2, 19
 involution and rigid cells, 388
 canonical, 387
 irreducible graph, 169
 isomorphic strings, 273
 isomorphic regular covering projections, 203
 isomorphism
 of a combinatorial object, 276
 of a digraph, 8
 i th partial product, 408
- Johnson graph, 226
 join of two partitions, 311
- (K, L) -generalized wreath product, 179
 k -ary relational structure, 296
 k -closure of G , 297
 k -homogeneous group, 233
 k -set-transitive group, 233
 k -transitive group, 84
 kernel of an action, 4
 key
 composite, 315
 of a circulant digraph, 312
 partition, 312
 space, 315

Index of Terms

511

- Laplacian matrix of a graph, 405
 lattice, 58
 left
 coset action of G on G/H , 19
 regular representation of a group, 13
 translation, 13
 length
 of a G -alternet, 454
 suborbit, 28
 Levi graph, 160
 of a configuration, 239
 of a design, 245
 lexi-partition of $G \wr H$ corresponding to Y , 152
 lexicographic product, 142
 $L(G)$ – the line graph of a graph Γ , 61
 lift, 203
 automorphism, 204
 group, 204
 lifting cycles, 406
 line graph, 61
 local action, 129
 of a graph, 395
 of a group, 395
 locally
 primitive, 395
 quasiprimitive, 447
 loosely attached, 454
 Lovász problem, 401

 m -step imprimitive, 300
 normally, 300
 (m, n) -metacirculant digraph, 35
 (m, n) -semiregular element, 108
 Magma, 77
 map, Cayley, 397
 meet of two vectors, 311
 metacirculant
 digraph, 34
 graph, 37
 weak, 38
 metacyclic group, 38
 method of Schur, 272
 multiplier, 274
 generalized, 315
 genuine generalized, 315

 N -covert, 201
 N -covering projection, 199
 non-Cayley number, 373
 nontrivial strongly regular graph, 470

 normal
 block quotient digraph, 116
 block system, 52
 Cayley digraph, 323
 closure of H in G , 337
 p -complement, 332
 normalizer of a subgroup, 43
 normally m -step imprimitive, 300
 O’Nan-Scott theorem, 193

 odd
 automorphism, 381
 graph, 225
 permutation, 5
 permutation group, 381, 472
 orbit
 of x in G , 6
 of a permutation, 93
 orbit-counting lemma, 124
 orbit-stabilizer theorem, 6
 orbital, 26
 digraph, 26
 digraph of an action, 30
 graph, 30
 paired, 30
 self-paired, 30
 trivial, 26
 orbital-odd group, 473
 orientation of a graph, 70
 orthogonal
 block systems, 334
 complement of a subspace, 159
 out adjacent, 179
 outer automorphism, 134
 outer edge, 249
 outside vertices, 249
 outvalence, 39
 outvalency of a regular digraph, 12

 p -adic expansion, 308
 paired orbital, 30
 partial line graph, 458
 permutation
 equivalent representations, 135
 even, 5
 isomorphic permutation groups, 133
 odd, 5
 representation, 4
 permutation group, 4
 degree, 5
 even, 381

- permutation group (cont.)
 - odd, 381
 - regular, 7
 - semiregular, 7
 - transitive, 5
- permutational wreath product of two groups, 144
- π -group, 280
- point in \mathbb{F}_q^d , 159
- point-hyperplane incidence graph of \mathbb{F}_q^d , 160
- point-line incidence graph of a configuration, 239
- points of an affine geometry, 125
- Polycirculant conjecture, 441
- primary
 - generalized multiplier, 308
 - genuine generalized multiplier, 310
 - key, 304
 - key partition, 306
 - key space, 304
- primitive group, 49
 - simply, 60
- product action, 191
- project automorphism, 204
- projective
 - general linear group, 85, 159
 - geometry, 160
 - point, 160
 - semilinear group, 195
 - space, 160
 - special linear group, 194
- quartic graph, 92
- quasi-dihedral group, 379
- quasi-semiregular automorphism, 450
- quasipolynomial function, 273
- quasiprimitive
 - group, 61
 - locally, 447
- quaternion group, 40
- quintic graph, 447
- quotient digraph with respect to a partition \mathcal{P} , 113
- quotient multigraph
 - corresponding to K , 406
 - corresponding to ρ , 406
- rank of a group, 28
- reachability relation, 453
- reducible graph, 169
- refinement
 - of a block system, 53
 - of a partition, 53
 - trivial, 53
- regular covering projection, 199
 - admissible, 204
 - equivalent, 203
 - G -admissible, 204
 - isomorphic, 203
- regular digraph, 12
- regular permutation group, 7
- relation on X , 76
- right regular representation of a group, 14
- root of an oriented cycle, 392
- rose window graph, 261, 398
- Sabidussi's theorem, 17
- s -arc, 88
 - regular, 88
 - transitive, 88
- scalar matrix, 159
- self-complementary graph, 279
- self-paired orbital, 30
- semidirect product
 - external, 44
 - internal, 32
 - of groups, 32
- semiregular element, 108
 - (m, n) -, 108
- semiregular permutation group, 7
- semiregularity problem, 123
- semisymmetric graph, 462
- sequence
 - Hamiltonian, 409
 - on S , 408
- set-transitive group, 233
- shunt automorphism, 382
- simplicial automorphism, 391
- simply primitive, 60
- socle of G , 157
- solving set of a circulant digraph, 314, 316
- special linear group, 194
- spiral path, 119
- spoke edge, 249
- square-free integer, 83
- stabilizer
 - of a block, 55
 - of a point, 5
- string, 273
 - isomorphic, 273

Index of Terms

513

- string isomorphism problem, 273
- strongly
 - connected digraph, 15
 - regular graph, 470
- subgroup
 - core-free, 24
 - pattern of a group, 66
 - torsion-free, 380
- suborbit, 28
 - length, 28
- symbol of a bicirculant graph, 368
- symmetric
 - design, 244
 - graph, 10
 - group, 4
- symmetry
 - of a configuration, 241
 - of a design, 244
- system of imprimitivity, 49
- tail
 - of an arc, 453
 - set of an G -alternet, 454
- Tait coloring, 248
- tetrahedral graphs, 226
- tightly attached, 454
- torsion-free subgroup, 380
- transfer, 329, 354
- transitive
 - closure of a relation, 454
 - constituent, 30
 - permutation group, 5
- translation, 126
- transversal of G/H , 329
- tree, 386
- triangular graph, 226
- trivial
 - block, 49
 - orbital, 26
 - refinement, 53
 - wreath product, 143
- truncation, 104
- twins, 169
- union of digraphs, 27
- uniprimitive, 60
- unique walk lifting property, 203
- unitary circulant graph, 130
- unworthy graph, 169
- valence of a vertex, 39
- valency of a graph, 10
- vertex
 - fibers, 199
 - inflation, 104
 - set of a digraph, 7
- vertex-transitive digraph, 8
- voltage
 - assignment, 201
 - function, 201
 - group, 201
 - of a walk, 202
- walk
 - consistent, 382
 - corresponding to a sequence, 408
 - voltage, 202
- weak metacirculant, 38
- weakly connected digraph, 15
- Weiss conjecture, 399
- Weiss's theorem, 396
- worthy graph, 169
- wreath product
 - deleted, 349
 - of digraphs, 141
 - of groups, 143
 - permutational, 144
 - trivial, 143
- zero-odd group, 473
- Zsigmondy's theorem, 298