
INDEX

- Adiabatic Quantum
 Computation 305, 310
Adiabatic Process 308
Adiabatic Theorem 308
Adjacency Matrices 319
Adjoint 46–47
Amplitude Damping 262
AND Gate 174
- Balanced Function 204
Basis vectors 20, 63
BB84 244
B92 Protocol 247
Bell states 166, 188
Bell's Theorem 151
Binary Entropy Function 297
Bipartite System 155
Bit-flip channel 261, 290
Bloch vector 115
Bra 28–30, 39
Bures Distance 289
- Cauchy-Schwartz 31
Characteristic equation 49
Circuit diagrams 185
Cluster State Quantum
 Computation 315–316, 324
Closed System 122
Closure relation 42
CNOT gate:
 In teleportation 226
Collective Dephasing 273
Commutator 66
Composite states 74
Conditional entropy 6
Concurrence 291
- Controlled-NOT Attack 246
Controlled-Rotation gate 271
CSS Codes 274
- Density Operator 85, 89, 92,
 233, 254
Depolarization Channel 260
Deutsch's algorithm 205
Deutsch-Jozsa Algorithm 207
- E91 Protocol 248
Eigenvalues 48, 303
Ensemble 85, 108
Entanglement 147, 225
 Of Formation 291
 Swapping 234
 When is a state entangled 229
 Witness 322
Entropy 3, 296, 301
Errors:
 Quantum Error Correction 272
 Single qubit 252
Expectation Value 57, 88
 And the density operator 95
- Fidelity 166, 286–289
- GHZ State 136, 322
Grover's Algorithm 218
Gram-Schmidt Process 26
- Hadamard Gate 198, 252
 Adiabatic 310
Hamiltonian 306, 312
Harmonic Oscillator 265
Hermitian Operator 46, 81

- Information content 2,4
- Inner product 21, 32, 76
- Interference 202
- Key 240
- Krauss Operators, 254, 259–260, 264
- Kronecker product 73
- Lambda State 318
- Linear Independence 18
- Local Realism 155
- Locking a quantum channel 232
- Logic Gates 173
- Matrix product 201
- Matrix representation 42, 83
- Measurements 70, 121, 132, 139
- Mixed State 91, 99, 105, 301
- No-cloning Theorem 279
- Normalization 12, 24, 29
- Normal Operators 46, 48
- NOT gate 173
- Number Operator 265
- Observables 40, 70
- Open Systems 251
- Operator 39, 79
- Orthogonality 35
- Orthonormality 24, 25
- Outer Product 41,43
- $\pi/8$ Gate 50
- Pauli Operators 40, 45, 67
- Pauli Representation 162
- Partial trace 111
- Peres Partial Transposition 229
- Phase Damping 270
- Phase estimation, 213
- Phase flip errors 253, 276
- Phase-Shift Gate 181
- Polar Decomposition 69
- Positive Operator 66
- Postulates of quantum mechanics 70
- POVM 141
- Privacy Amplification 248
- Probability 7–8, 12
 - And the density operator 95
- Projection Operator 62,
 - 123–125, 193
- Pure state 86
- Purification 169
- Quantum Algorithms 197
- Quantum Cryptography 239, 243
- Quantum Fourier Transform 211
- Quantum Noise 251
- Quantum parallelism 203
- Qubit 11, 15, 65, 128
- Qubit Trine 33
- Raising operator 263
- Reduced density operator 111
- Relative Von Neumann Entropy 298
- RSA Encryption 241
- Schmidt Coefficients 168
- Schrödinger Equation 71, 306
- Separable State 157
- Shannon Entropy 3–5, 296
- Shor's Algorithm 216
- Singlet State 149
- Singular Values 69
- Spanning set of basis vectors 19
- Spectral Decomposition 53
- Square Well 307
- Stabilizer States 320
- Stationary State 306
- Subadditivity 297, 302
- Superdense Coding 235–237
- Syndrome Measurement 275
- Teleportation 226
- Tensor Products 73
- Time Evolution
 - Density operator 90
- Trace 54, 281, 287
 - Of density operator 93
- Trace Distance 281–286
- Trace-preserving operations 254
- Triangle Inequality 31–32
- Uncertainty 58, 68
- Unitary Operators 46, 48, 60
- Vector spaces 14
- W-State 237
- X-Gate 41, 98, 176–177, 320
- XOR Gate 174
- Y-Gate 44, 138, 170
- Z-Gate 44, 55, 180