

Willi-Hans Steeb
Yorick Hardy

PROBLEMS
3rd
Edition
AND
SOLUTIONS
IN
QUANTUM
COMPUTING
AND
QUANTUM
INFORMATION

Contents

Preface	v
Notation	ix
I Finite-Dimensional Hilbert Spaces	1
1 Qubits	3
2 Kronecker Product and Tensor Product	21
3 Matrix Properties	39
4 Density Operators	77
5 Trace and Partial Trace	97
6 Reversible Logic Circuits	107
7 Unitary Transforms and Quantum Gates	115
8 Entropy	147
9 Measurement	159
10 Entanglement	179
11 Bell Inequality	223
12 Teleportation	233
13 Cloning	243
14 Quantum Algorithms	247
15 Quantum Error Correction	265

16 Quantum Cryptography	273
II Infinite-Dimensional Hilbert Spaces	281
17 Harmonic Oscillator and Bose Operators	283
18 Coherent States	313
19 Squeezed States	329
19.1 Single Mode Squeezing	329
19.2 Two Mode Squeezing	340
19.3 Coherent Squeezed States	342
20 Trace and Partial Trace	345
21 Entanglement	351
22 Teleportation	369
23 Swapping and Cloning	373
24 Homodyne Detection	377
25 Hamilton Operators	381
Bibliography	395
Index	407