

Contents

Acknowledgments	ix
Introduction	xxxv
Chapter 1: Exploring Popular SQL Implementations	1
Introduction to SQL	1
Understanding the SQL Standard	2
Overview of Vendor Implementations of SQL	2
Oracle	3
IBM DB2 UDB	3
Microsoft SQL Server and Sybase	3
MySQL	3
PostgreSQL	4
Connecting to SQL Databases	4
ANSI SQL Data Types	5
Creating SQL Databases	5
Querying SQL Databases	7
Manipulating Data in SQL Databases	9
Summary	11
Chapter 2: Functions: Concept and Architecture	13
What Is a Function?	13
Simple UNIX Shell Function Example	14
Simple SQL Function Example	15
ANSI SQL Functions	15
Built-in Functions	16
Executing Built-in Functions	17
Practical Uses of Functions	17
Creating, Compiling, and Executing a SQL Function	18
Passing Parameters by Value or by Reference	22
Scope of a Function	24
Better Security	25
Overloading	25
Classifying SQL Functions: Deterministic and Non-Deterministic Functions	27
Oracle	29
IBM DB2 UDB	29

Contents

Microsoft SQL Server	30
Sybase	31
MySQL and PostgreSQL	31
Summary	32
Chapter 3: Comparison of Built-in SQL Functions by Vendor	33
Types of Functions	33
Classifying Built-in SQL Functions	34
Oracle	35
IBM DB2 UDB	36
Microsoft SQL Server and Sybase ASE	37
MySQL	39
PostgreSQL	39
Overview of Built-in Functions by Vendor	40
Summary	48
Chapter 4: SQL Procedural Extensions and User-Defined Functions	49
Procedural versus Declarative Languages	49
ANSI SQL Guidance for Procedural Extensions to SQL	51
SQL Procedural Extensions by Vendor	52
Oracle PL/SQL	52
Microsoft or Sybase Transact-SQL	54
IBM Procedural SQL	55
MySQL	57
PostgreSQL	57
Summary	58
Chapter 5: Common ANSI SQL Functions	59
ANSI Query Syntax	60
Aggregate Functions	60
AVG()	62
COUNT()	63
MAX() and MIN()	64
SUM()	65
String Functions	65
ASCII()	66
CHR() or CHAR()	67
CONCAT()	67
LOWER() and UPPER()	68
LENGTH() or LEN()	68
REPLACE()	69

Mathematical Functions	69
ABS()	72
ACOS()	73
ASIN()	73
ATAN() and ATAN2()	74
CEIL() or CEILING() and FLOOR()	74
COS()	75
COSH()	75
COT()	75
DEGREES() and RADIANS()	76
EXP()	76
LOG(), LN(), LOG2(), and LOG10()	77
MOD()	77
PI()	79
POWER()	79
RAND()	80
ROUND()	80
SIGN()	81
SINH()	82
SQUARE()	82
SQRT()	83
TAN()	83
TANH()	83
TRUNC() or TRUNCATE()	84
Miscellaneous Functions	85
COALESCE()	85
NULLIF()	85
Summary	86
 Chapter 6: Oracle SQL Functions	 87
Oracle Query Syntax	87
Aggregate Functions	90
AVG()	91
CORR()	92
COUNT()	93
GROUPING()	94
MAX() and MIN()	95
STDDEV()	95
SUM()	96
Analytic Functions	97

Contents

Character Functions	97
CHR() and NCHR()	99
INITCAP()	100
LPAD() and RPAD()	101
TRIM(), LTRIM(), and RTRIM()	102
REPLACE()	103
SOUNDEX()	103
SUBSTR()	104
TRANSLATE()	105
Regular Expressions	106
Conversion Functions	106
CAST()	107
COMPOSE()	108
CONVERT()	108
DECOMPOSE()	110
TO_CHAR()	110
TRANSLATE...USING	113
UNISTR()	113
Date and Time Functions	114
ADD_MONTHS()	115
DBTIMEZONE and SESSIONTIMEZONE	116
EXTRACT()	117
MONTH_BETWEEN()	118
NEW_TIME()	118
ROUND()	119
SYSDATE	120
TRUNC()	121
Numeric Functions	123
ABS()	123
BITAND()	124
CEIL() and FLOOR()	124
MOD()	125
SIGN()	125
ROUND()	126
TRUNC()	127
Object Reference Functions	127
Miscellaneous Single-Row Functions	127
COALESCE()	128
DECODE()	129
DUMP()	130
GREATEST()	131
NULLIF()	132
NVL()	133

NVL2()	133
UID	134
VSIZE()	134
Summary	135
 Chapter 7: IBM DB2 Universal Database (UDB) SQL Functions	 137
 DB2 UDB Query Syntax	 138
String Functions	140
CONCAT()	142
INSERT()	142
LEFT() and RIGHT()	143
LENGTH()	143
LOCATE() and POSSTR()	144
LTRIM() and RTRIM()	144
REPEAT()	145
REPLACE()	145
SOUNDEX()	146
SPACE()	146
SUBSTR()	147
TRUNC() or TRUNCATE()	147
Date and Time Functions	148
DATE()	150
DAY()	151
DAYNAME()	151
DAYOFWEEK()	152
DAYOFWEEK_ISO()	152
DAYOFYEAR()	153
DAYS()	153
HOUR()	153
JULIAN_DAY()	154
MICROSECOND()	155
MIDNIGHT_SECONDS()	155
MINUTE()	156
MONTH()	156
MONTHNAME()	157
SECOND()	157
TIME()	157
TIMESTAMP()	158
TIMESTAMPDIFF()	159
TIMESTAMP_FORMAT()	160
TIMESTAMP_ISO()	160
WEEK()	160

Contents

WEEK_ISO()	161
YEAR()	161
Conversion Functions	162
DEC or DECIMAL	163
HEX()	164
DOUBLE or DOUBLE_PRECISION	164
INT() or INTEGER() and SMALLINT()	165
TRANSLATE()	165
VARCHAR()	166
Security Functions	167
DECRYPT_BIN()	167
DECRYPT_CHAR()	168
ENCRYPT()	168
GETHINT()	169
IBM DB2 UDB Special Registers	169
CURRENT DATE	170
CURRENT DEFAULT TRANSFORM GROUP	171
CURRENT DEGREE	171
CURRENT EXPLAIN MODE	171
CURRENT EXPLAIN SNAPSHOT	172
CURRENT ISOLATION	172
CURRENT NODE	173
CURRENT PATH	173
CURRENT QUERY OPTIMIZATION	174
CURRENT REFRESH AGE	174
CURRENT SCHEMA	174
CURRENT SERVER	175
CURRENT TIME	175
CURRENT TIMESTAMP	175
CURRENT TIMEZONE	176
SESSION_USER	176
USER	177
Miscellaneous Functions	177
COALESCE() and VALUE()	178
DIGITS()	179
GENERATE_UNIQUE()	179
NULLIF()	180
RAND()	180
TABLE_NAME()	181
TYPE_ID()	182
TYPE_NAME()	182
Summary	182

Chapter 8: Microsoft SQL Server Functions	183
SQL Server Query Syntax	183
String Functions	185
ASCII()	187
CHAR()	187
CHARINDEX()	188
DIFFERENCE()	188
LEFT() and RIGHT()	189
LEN()	189
LOWER()	190
LTRIM() and RTRIM()	190
NCHAR()	191
PATINDEX()	191
REPLACE()	192
QUOTENAME()	192
REPLICATE()	192
REVERSE()	193
SOUNDEX()	193
SPACE()	194
STR()	194
STUFF()	195
SUBSTRING()	196
UNICODE()	196
UPPER()	196
Date and Time Functions	197
DATEADD()	198
DATEDIFF()	199
@@DATEFIRST()	199
DATENAME()	200
DATEPART()	200
DAY()	201
GETDATE() and GETUTCDATE()	202
MONTH()	202
YEAR()	203
Metadata Functions	203
COL_LENGTH()	204
DB_ID()	205
DB_NAME()	205
FILE_ID()	206
FILE_NAME()	207

Contents

Configuration Functions	207
@@CONNECTION	207
@@LANGID	208
@@LANGUAGE	208
@@LOCK_TIMEOUT	210
@@MAX_CONNECTIONS	210
@@NESTLEVEL	211
@@OPTIONS	211
@@SPID	211
@@VERSION	212
Security Functions	212
HAS_DBACCESS()	213
SUSER_SID()	214
SUSER_SNAME()	214
USER	214
USER_ID()	215
USER_NAME()	215
System Functions	216
APP_NAME()	219
CASE	219
CAST() and CONVERT()	220
COALESCE()	224
CURRENT_TIMESTAMP	225
CURRENT_USER	225
DATALength()	226
@@ERROR	226
HOST_ID()	227
HOST_NAME()	227
@@IDENTITY	228
IDENTITY()	228
ISDATE()	229
ISNULL()	229
ISNUMERIC()	230
NEWID()	230
PERMISSIONS()	231
ROWCOUNT_BIG and @@ROWCOUNT	231
@@TRANCOUNT	232
COLLATIONPROPERTY()	233
SCOPE_IDENTITY()	233
System Statistical Functions	234
@@CPU_BUSY	235
@@IDLE	235

@@IO_BUSY	236
@@TIMETICKS	236
@@TOTAL_ERRORS	236
@@TOTAL_READ	237
@@TOTAL_WRITE	237
fn_virtualfilestats()	238
Undocumented Functions	239
ENCRYPT()	240
FN_GET_SQL()	240
@@MICROSOFTVERSION	241
PWDCOMPARE()	241
PWDENCRYPT()	242
TSEQUAL()	242
Summary	243
 Chapter 9: Sybase ASE SQL Built-In Functions	 245
 Sybase Query Syntax	 246
String Functions	247
CHARINDEX()	249
CHAR_LENGTH()	250
COMPARE()	250
DIFFERENCE()	252
LTRIM() and RTRIM()	252
PATINDEX()	253
REPLICATE()	254
REVERSE()	254
RIGHT() and LEFT()	255
SORTKEY()	255
SOUNDEX()	257
SPACE()	257
STR()	257
STUFF()	258
SUBSTRING()	259
USCALAR()	259
Date and Time Functions	260
DATEADD()	261
DATEDIFF()	262
DATENAME()	262
DATEPART()	263
GETDATE()	264

Contents

Conversion Functions	264
CONVERT()	266
INTTOHEX()	270
HEXTOINT()	271
Security Functions	271
IS_SEC_SERVICE_ON()	272
SHOW_SEC_SERVICES()	272
Aggregate Functions	272
AVG()	273
COUNT()	274
MAX()	274
MIN()	275
SUM()	275
Mathematical Functions	275
ABS()	277
ACOS()	278
ASIN()	278
ATAN()	278
ATN2()	279
CEILING()	279
COS()	280
COT()	280
DEGREES()	280
EXP()	281
FLOOR()	281
LOG()	281
LOG10()	282
PI()	282
POWER()	282
RADIANS()	283
RAND()	283
ROUND()	284
SIGN()	285
SIN()	285
SQRT()	286
TAN()	286
Text and Image Functions	286
TEXTPTR()	287
TEXTVALID()	287
System Functions	288
COL_LENGTH()	289
COL_NAME()	290

DATALENGTH()	291
DB_ID()	291
DB_NAME()	292
OBJECT_ID()	292
OBJECT_NAME()	293
RAND()	293
SUSER_ID()	294
SUSER_NAME()	295
TSEQUAL()	295
USER()	296
USER_ID()	296
USER_NAME()	297
VALID_NAME()	297
VALID_USER()	298
Unary System Functions	299
@@BOOTTIME	301
@@CLIENT_CSID	301
@@CLIENT_CSNAME	302
@@CONNECTIONS	302
@@CPU_BUSY	303
@@ERROR	303
@@ERRORLOG	303
@@IDENTITY	304
@@IDLE	305
@@IO_BUSY	305
@@LANGID	305
@@LANGUAGE	306
@@MAXCHARLEN	306
@@MAX_CONNECTIONS	306
@@NCHARSIZE	307
@@NESTLEVEL	307
@@OPTIONS	308
@@PROBESUID	308
@@ROWCOUNT	308
@@SPID	309
@@SQLSTATUS	309
@@TIMETICKS	310
@@TOTAL_ERRORS	310
@@TOTAL_READ	311
@@TOTAL_WRITE	311
@@TRANCHAINED	311
@@TRANCOUNT	312

Contents

@@TRANSTATE	312
@@UNICHARSIZE	313
@@VERSION	313
@@VERSION_AS_INTEGER	314
Summary	314

Chapter 10: MySQL Functions **315**

MySQL Query Syntax **315**

Aggregate Functions **317**

AVG()	318
COUNT()	318
MAX() and MIN()	319
SUM()	319

Numeric Functions **319**

ABS()	322
ACOS()	323
ASIN()	323
ATAN()	323
ATAN2()	323
BIT_AND()	324
BIT_COUNT()	324
BIT_OR()	325
CEIL() or CEILING()	325
CONV()	325
COS()	326
COT()	326
DEGREES()	326
EXP()	327
FLOOR()	327
FORMAT()	327
GREATEST()	328
INTERVAL()	328
LEAST()	328
LOG()	329
LOG10()	329
MOD()	329
OCT()	330
PI()	330
POW() or POWER()	330
RADIANS()	331
RAND()	331

ROUND()	331
SIGN()	332
SIN()	332
SQRT()	332
STD() or STDDEV()	332
TAN()	333
TRUNCATE()	333
String Functions	333
ASCII()	338
BIN()	339
CHAR()	339
COMPRESS()	339
CONCAT()	340
CONCAT_WS()	340
ELT()	341
FIELD()	341
FIND_IN_SET()	342
HEX()	342
INSERT()	342
INSTR()	343
ISNULL()	343
LCASE() or LOWER()	344
LEFT()	344
LENGTH(), CHAR_LENGTH(), and CHARACTER_LENGTH()	344
LOCATE()	345
LPAD()	346
LTRIM()	346
MAKE_SET()	346
NULLIF()	347
OCT()	347
ORD()	348
REPEAT()	348
REPLACE()	348
REVERSE()	349
RIGHT()	349
RPAD()	349
RTRIM()	350
SOUNDEX()	350
SUBSTRING()	350
SUBSTRING_INDEX()	351
TRIM()	352
UCASE() or UPPER()	352

Contents

UNCOMPRESS()	352
UNCOMPRESSED_LENGTH()	353
Date-Time Functions	353
CURDATE()	356
CURTIME()	356
DATE_ADD() or DATE_SUB()	357
DATE_FORMAT()	358
DAYNAME()	359
DAYOFMONTH()	360
DAYOFYEAR()	360
FROM_DAYS()	360
FROM_UNIXTIME()	361
HOUR()	361
MINUTE()	361
MONTH()	362
MONTHNAME()	362
NOW() or SYSDATE()	362
PERIOD_ADD()	362
PERIOD_DIFF()	363
SECOND()	363
SEC_TO_TIME()	363
TIME_FORMAT()	364
TIME_TO_SEC()	364
TO_DAYS()	364
UNIX_TIMESTAMP()	365
Miscellaneous Functions	365
BENCHMARK()	366
COALESCE()	366
CONNECTION_ID()	366
DATABASE()	367
LOAD_FILE()	367
Summary	367
 Chapter 11: PostgreSQL Functions	 369
 PostgreSQL Query Syntax	 369
Aggregate Functions	371
AVG()	372
COUNT()	373
MAX()	373
MIN()	374
STDDEV()	374

SUM()	374
VARIANCE()	375
String Functions	375
ASCII()	377
BTRIM()	378
BIT_LENGTH()	378
CHAR_LENGTH()	379
CHR()	379
CONVERT()	379
DECODE()	380
ENCODE()	380
INITCAP()	380
LENGTH()	381
LOWER()	381
LPAD()	381
LTRIM()	382
MD5()	382
OCTET_LENGTH()	383
OVERLAY()	383
POSITION()	383
QUOTE_IDENT()	384
QUOTE_LITERAL()	384
REPEAT()	384
REPLACE()	385
RPAD()	385
RTRIM()	386
SUBSTRING()	386
TRIM()	387
UPPER()	387
Mathematical Functions	388
ABS()	389
ACOS()	390
ASIN()	390
ATAN()	390
ATAN2()	391
CBRT()	391
CEIL()	391
COS()	392
COT()	392
DEGREES()	393
EXP()	393
FLOOR()	393

Contents

LN()	394
LOG()	394
MOD()	394
PI()	395
POW()	395
RADIANS()	395
RANDOM()	396
ROUND()	396
SETSEED()	397
SIGN()	397
SIN()	397
SQRT()	398
TRUNC()	398
Date-Time Functions	398
AGE()	399
CURRENT_DATE()	400
CURRENT_TIME()	400
DATE_PART()	400
DATE_TRUNC()	401
EXTRACT()	401
ISFINITE()	402
LOCALTIME()	402
LOCALTIMESTAMP	402
NOW()	403
TIMEOFDAY()	403
Geometric Functions	403
AREA()	404
BOX_INTERSECT()	405
CENTER()	405
DIAMETER()	405
HEIGHT()	406
ISCLOSED()	406
ISOPEN()	406
LENGTH()	407
NPOINTS()	407
PCLOSE()	407
POPEN()	408
RADIUS()	408
WIDTH()	408
Miscellaneous Functions	409
COALESCE()	409
CURRENT_DATABASE	410

CURRENT_SCHEMA	410
CURRENT_USER	411
NULLIF()	411
SESSION_USER	412
USER	412
VERSION	412
Summary	413
 Chapter 12: ANSI SQL User-Defined Functions	 415
 User-Defined Functions or SQL Routines?	 415
Functions versus Procedures	416
Internal versus External Functions	417
Creating UDFs	417
Altering UDFs	419
Removing UDFs	419
Summary	419
 Chapter 13: Creating User-Defined Functions in Oracle	 421
 PL/SQL Compiler	 421
Oracle 10g Compiler Optimization	422
Acquiring Permissions	423
Creating UDFs	424
Creating a Recursive UDF	428
Creating an Aggregate UDF	430
Creating a Table-Valuated, Pipelined UDF	430
Altering UDFs	431
Dropping UDFs	432
Debugging PL/SQL Functions	432
DBMS_OUTPUT	433
DBMS_DEBUG	434
Error Handling in PL/SQL Functions	434
Adding PL/SQL Functions to an Oracle Package	437
Overloading	439
Using PL/SQL UDF in Transactions	441
Compiling PL/SQL Modules into Machine Code	441
Finding Information about UDFs in the RDBMS	443
Restrictions on Calling PL/SQL UDFs from SQL	445
Summary	447

Chapter 14: Creating User-Defined Functions with IBM DB2 UDB 449

Acquiring Permissions	450
Creating UDFs	451
Creating Scalar UDFs	452
Creating Table UDFs	455
Creating Sourced UDFs	457
Creating Template UDFs	458
Overriding with Sourced UDFs	458
Altering UDFs	459
Dropping UDFs	459
Debugging UDFs	461
Error Handling in UDFs	463
SQLCODE and SQLSTATE	465
Using Error Messages	465
Overloading	471
Using SQL PL UDF in Transactions	473
Finding Information about UDFs in the Database	474
Restriction on UDFs	475
Summary	476

Chapter 15: Creating User-Defined Functions Using Microsoft SQL Server 477

Acquiring Permissions	477
Creating UDFs	478
Rules for Naming Identifiers	479
Creating Scalar-Valued UDFs	482
Creating Inline, Table-Valued UDFs	484
Creating Multistatement, Table-Valued UDFs	486
Schema-Bound UDFs	487
Encrypting Transact-SQL Functions	488
Recursive Functions	488
Creating Template UDFs	489
Creating UDFs with Extended Stored Procedures	490
Built-in System UDFs	492
Creating a System UDF	493
Altering UDFs	495
Dropping UDFs	496
Debugging Transact-SQL UDFs	497
Error Handling in Transact-SQL UDFs	502
Using Transact-SQL UDFs in Transactions	503

Finding Information about UDFs	503
Restrictions on Transact-SQL UDFs	507
Summary	508
Chapter 16: Creating User-Defined Functions in Sybase SQL	509
Acquiring Privileges	509
Creating UDFs	510
Handling NULL Argument Values	513
Handling NULLS When Creating the Function	514
Mapping Java and SQL Data Types	514
Altering UDFs	516
Dropping UDFs	517
Debugging UDFs	517
Error Handling in UDFs	517
Finding Information about UDFs	518
Summary	519
Chapter 17: Creating User-Defined Functions in MySQL	521
Acquiring Permissions	521
Creating UDFs	521
Creating External Functions	525
Altering UDFs	525
Dropping UDFs	526
Error Handling and Debugging	526
Finding Information about UDFs	526
Summary	529
Chapter 18: Creating User-Defined Functions in PostgreSQL	531
Acquiring Permissions	532
Query SQL Functions	533
Using Composite Types with PostgreSQL Functions	534
SQL Row and Table Functions	536
Dropping UDFs	537
Debugging PostgreSQL UDFs	538
Error Handling	538
Overloading UDFs	538
Finding Information about UDFs	539
PG_PROC Functions	539
ROUTINES Functions	540
ROUTINE PRIVILEGES Functions	542

Contents

Restrictions on Calling UDFs from SQL	543
Summary	543
Chapter 19: Reporting and Ad Hoc Queries	545
Identifying Your Reporting Needs	545
Creating Standardized Reports	546
Processing Ad Hoc Query Requests	549
Effectively Delivering Data to the Requestor	554
Summary	555
Chapter 20: Using Functions for Migrating Data	555
Understanding Migration of Data	555
Causes and Effects of Migrating	556
Databases Migrating Databases	556
Migrating Data	557
Migrating Other Database-Related Components	557
Understanding the Data Migration Process	557
Planning Migration	557
Testing the Migration Plan	558
Implementing the Migration Plan	558
Validating a Successful Migration	559
SQL Function's Role in Data Migration	559
Common Functions Used	559
Examples	560
Summary	564
Chapter 21: Using Functions to Feed a Data Warehouse	565
Architecture of a Data Warehouse	566
SQL Function's Role in Data Warehouse Processing	566
Feeding a Data Warehouse	566
Querying a Data Warehouse	567
Maintaining a Data Warehouse	569
Feeding and Using the Data Warehouse	569
Data Scrubbing	569
Standardizing Data from Multiple Database Environments	570
Summarizing Data	572
Concatenating Data	574
Breaking Data Apart and Putting It Back Together	575
Summary	576

Chapter 22: Embedded Functions and Advanced Uses	577
ESQL Statements	578
Static versus Dynamic Querying	579
Common Uses of Embedded Functions	581
Single-Row Functions	582
Scalar Functions	584
Aggregate Functions	585
Mathematical Functions	586
Date and Time Functions	588
String Functions	589
Summary	590
Chapter 23: Generating SQL with SQL and SQL Functions	591
Using Literal Values, Column Values, and Concatenation	591
Other Functions Commonly Used to Generate SQL Code	595
Summary	599
Chapter 24: SQL Functions in an Application	601
Calling Functions from an Application	601
Establishing a Database Connection	602
Connection Pools	602
Modeling the Process	604
Creating or Identifying the SQL Functions	605
Coding the Application Component	606
Sample User Login Application Using VB.Net and SQL Server	608
Sample User Login Application Using Java and Oracle	611
Sample User Login Application Using ASP.NET	613
Summary	616
Chapter 25: Empowering the Query with Functions and Views	617
Understanding How Views Empower Queries	618
Understanding the Role of SQL Functions in Views	620
Summary	625
Chapter 26: Understanding the Impact of SQL Functions on Query and Database Performance	627
Prioritizing Transaction and Query Performance	627
Transactional Database Architecture	628
Analytical Processing Database Architecture	629

Contents

Understanding the Adverse Effects of Function Performance	630
Effects on Query Performance	630
Effects on Database Performance	630
Effects on Non-database Resources	631
Examining the Impact of SQL Functions in SQL Statements	631
SELECT Clause	632
FROM Clause	632
WHERE Clause	632
GROUP BY Clause	632
Comparing Built-in Functions and User-Defined Functions	633
Creating a Balance between Security and Performance	633
Summary	634
 Chapter 27: Useful Queries from the System Catalog	 635
 Useful System Catalog Queries for the Programmer	 635
Oracle	636
USER_CATALOG	638
USER_TABLES	639
USER_VIEWS	639
IBM DB2	641
FUNCTIONS	641
SCHEMATA	642
TABLES	643
VIEWS	644
PostgreSQL	645
Pg_tables	646
Pg_user	646
Pg_views	647
Microsoft SQL Server	648
SYSCOLUMNS	648
SYSCOMMENTS	649
SYSOBJECTS	650
SYSUSERS	651
Sybase	652
SYSCOLUMNS	653
SYSDOMAIN	654
SYSTABLE	654
MySQL	655
Summary	656

Appendix A: Built-in Function Cross-Reference Table	657
Appendix B: ANSI and Vendor Keywords	669
ANSI SQL Keywords	669
Oracle Keywords	680
Oracle 9i Reserved Words and Keywords	681
Oracle 10g Reserved Words and Keywords	682
DB2 Reserved Words and Keywords	683
SQL Server Reserved Words	685
SQL Server 2000 Reserved Words	685
SQL Server ODBC Reserved Words	686
MySQL Reserved Words and Keywords	689
Sybase Reserved Words and Keywords	690
PostgreSQL Reserved Words and Keywords	691
Appendix C: ANSI and Vendor Data Types	695
ANSI SQL Data Types	695
Oracle 9i Data Types	696
Oracle 10g Data Types	696
IBM DB2 Data Types	696
SQL Server Data Types	697
Sybase Data Types	697
MySQL Data Types	697
PostgreSQL Data Types	698
Appendix D: Database Permissions by Vendor	699
Oracle 9i Privileges	699
Oracle 9i Object Privileges	701
Oracle 10g Privileges	701
Oracle 10g Object Privileges	703
IBM DB2 Database Privileges	703
IBM DB2 Privileges	704
IBM DB2 Object Privileges	705
SQL Server Permissions	706
Sybase Permissions	706
MySQL Privileges	707
PostgreSQL Privileges	707
PostgreSQL Object Privileges	708

Contents

Appendix E: ODBC and Stored Procedures and Functions	709
Appendix F: JDBC and Stored Procedures/Functions	711
Glossary	713
Index	721