
Contents

<i>Preface</i>	ix
<i>Acknowledgements</i>	xii
1 Introduction	1
1.1 Flight instruments	1
1.2 Cockpit layouts	17
1.3 Multiple-choice questions	20
2 Number systems	25
2.1 Decimal (denary) numbers	25
2.2 Binary numbers	26
2.3 Octal numbers	30
2.4 Hexadecimal numbers	33
2.5 American standard code for information interchange	36
2.6 Multiple-choice questions	37
3 Data conversion	39
3.1 Analogue and digital signals	39
3.2 Digital to analogue conversion	41
3.3 Analogue to digital conversion	45
3.4 Multiple-choice questions	51
4 Data buses	53
4.1 Introducing bus systems	53
4.2 ARINC 429	59
4.3 Other bus standards	65
4.4 Multiple-choice questions	67
5 Logic circuits	70
5.1 Introducing logic	70
5.2 Logic circuits	71
5.3 Boolean algebra	74
5.4 Combinational logic	76
5.5 Tri-state logic	80
5.6 Monostables	81

5.7 Bistables	83
5.8 Logic families	88
5.9 Multiple-choice questions	93
6 Computers	95
6.1 Computer systems	95
6.2 Data representation	96
6.3 Data storage	98
6.4 Programs and software	105
6.5 Backplane bus systems	109
6.6 Some examples of aircraft computer systems	111
6.7 Multiple-choice questions	113
7 The CPU	116
7.1 Internal architecture	116
7.2 Microprocessor operation	123
7.3 Intel x86 family	126
7.4 The Intel Pentium family	132
7.5 AMD 29050	133
7.6 Multiple-choice questions	136
8 Integrated circuits	139
8.1 Scale of integration	139
8.2 Fabrication technology	139
8.3 Packaging and pin numbering	142
8.4 Multiple-choice questions	144
9 MSI logic	149
9.1 Fan-in and fan-out	149
9.2 Coding systems	150
9.3 Decoders	153
9.4 Encoders	156
9.5 Multiplexers	158
9.6 Multiple-choice questions	163
10 Fibre optics	165
10.1 Advantages and disadvantages	165
10.2 Propagation in optical fibres	166
10.3 Dispersion and bandwidth	170
10.4 Practical optical networks	171
10.5 Optical network components	174
10.6 Multiple-choice questions	175
11 Displays	178
11.1 CRT displays	179
11.2 Light emitting diodes	186
11.3 Liquid crystal displays	191
11.4 Multiple-choice questions	195

12 ESD	197
12.1 Static electricity	197
12.2 Static-sensitive devices	201
12.3 ESD warnings	201
12.4 Handling and transporting ESDs	204
12.5 Multiple-choice questions	205
13 Software	207
13.1 Software classification	207
13.2 Software certification	207
13.3 Software upgrading	210
13.4 Data verification	216
13.5 Multiple-choice questions	217
14 EMC	218
14.1 EMI generation	218
14.2 EMC and avionic equipment	222
14.3 Spectrum analysis	223
14.4 Effects and causes of EMI	231
14.5 Aircraft wiring and cabling	233
14.6 Grounding and bonding	233
14.7 Multiple-choice questions	236
15 Avionic systems	238
15.1 Aircraft communication addressing and reporting system	238
15.2 EFIS	240
15.3 Engine indication and crew alerting system	248
15.4 Fly-by-wire	250
15.5 Flight management system	250
15.6 Global Positioning System	251
15.7 Inertial reference system	254
15.8 Traffic alert collision avoidance system	256
15.9 Automatic test equipment	258
15.10 Built-in test equipment	258
15.11 Multiple-choice questions	259
16 Aircraft data networks and AFDX	261
16.1 Integrated modular avionics	261
16.2 Local area networks	262
16.3 LAN topology	262
16.4 Ethernet	264
16.5 Avionics full-duplex switched networks	265
16.6 Determinism and quality of service	267
16.7 Virtual links	268
16.8 Bandwidth allocation	269
16.9 AFDX frame format	270
16.10 Redundancy, reliability and integrity checking	271
16.11 Multiple-choice questions	274

17 Large-scale logic systems and VHDL	277
17.1 The need for hardware description languages	277
17.2 Entities and entity declarations	278
17.3 Behavioural declarations	280
17.4 VHDL design flow	282
17.5 VHDL program structure	283
17.6 VHDL signal modes and types	284
17.7 VHDL operators	285
17.8 Logic decisions and program flow	285
17.9 Simulation and the test bench	288
17.10 Timing	290
17.11 Multiple-choice questions	292
18 Integrated modular avionics (IMA)	294
18.1 Why IMA?	294
18.2 What is IMA?	295
18.3 IMA architecture	297
18.4 The IMA platform	302
18.5 An IMA example	304
18.6 Multiple-choice questions	306
19 Cabin systems	307
19.1 Cabin functions and services	307
19.2 Cabin network server systems	309
19.3 The IFE subsystem	311
19.4 Multiple-choice questions	316
20 Aircraft information systems	317
20.1 Information systems	317
20.2 Electronic flight bags	321
20.3 Integrated aircraft information systems	332
20.4 Multiple-choice questions	334
<i>Appendix 1 Abbreviations and acronyms</i>	336
<i>Appendix 2 Revision papers</i>	349
<i>Appendix 3 Answers</i>	376
<i>Appendix 4 Serial data communications: RS-232</i>	387
<i>Appendix 5 Decimal, octal, hexadecimal, binary and ASCII values</i>	391
<i>Index</i>	394