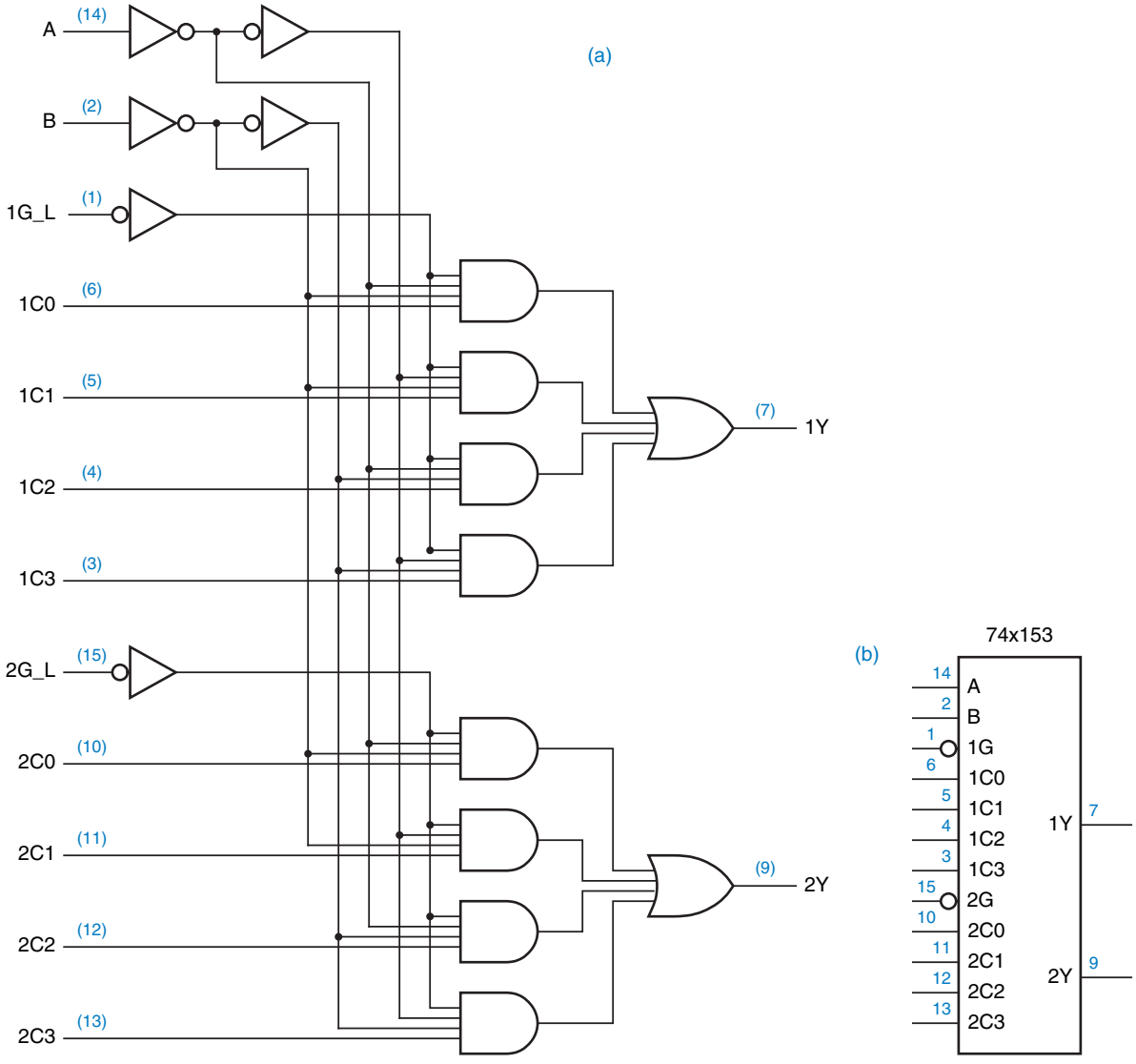
Mux: Another Multiplexer

Mux.1 The 74x153 4-Input, 2-Bit Multiplexer

74x153

Intermediate between the 74x151 and 74x157 is the *74x153*, a 4-input, 2-bit multiplexer. This device, whose logic diagram and symbol are shown in Figure Mux-1, has separate enable inputs (1G, 2G) for each bit. As shown in Table Mux-1, its function is very straightforward.

Figure Mux-1 The 74x153 4-input, 2-bit multiplexer: (a) internal logic diagram; (b) traditional logic symbol.



Inputs				Outputs	
1G_L	2G_L	B	A	1Y	2Y
0	0	0	0	1C0	2C0
0	0	0	1	1C1	2C1
0	0	1	0	1C2	2C2
0	0	1	1	1C3	2C3
0	1	0	0	1C0	0
0	1	0	1	1C1	0
0	1	1	0	1C2	0
0	1	1	1	1C3	0
1	0	0	0	0	2C0
1	0	0	1	0	2C1
1	0	1	0	0	2C2
1	0	1	1	0	2C3
1	1	x	x	0	0

Table Mux-1 Truth table for a 74x153 4-input, 2-bit multiplexer.

Exercises

Mux.1 Write an ABEL, VHDL, or Verilog program for the 74x153 multiplexer with the function table shown in Table Mux-1.

Mux.2 Design a customized multiplexer with four 4-bit input buses P, Q, R, and T, selecting one of the buses to drive a 4-bit output bus Y according to Table xMux.2. Use two 74x153s and a code converter that maps the eight possible values on S2–S0 to four select codes for the 74x153s. Choose a code that minimizes the size and propagation delay of the code converter.

S2	S1	S0	*Input to Select*
0	0	0	A
0	0	1	B
0	1	0	A
0	1	1	C
1	0	0	A
1	0	1	D
1	1	0	A
1	1	1	E

Table xMux.2