...ddel function when the 7442 is used as a 3 to 8 decoder.

...nificant input, A_3 produces a useful

4.4.7 BCD to 7 Segment Display Decoder/Driver

In most practical applications, seven segment displays are used to give a visual indication of the output states of digital ICs such as decade counters, latches etc. These outputs are usually in four bit BCD (binary coded decimal) form, and are thus not suitable for directly driving seven segment displays. The special BCD to seven segment decoder/driver ICs are used to convert the BCD signal into a form suitable for driving these displays. In this sections, we are going to study LED and LCD decoders/drivers for seven segment displays. Let us tabulate the segments activated during each digit display.

Digit	Segments Activated	Display
0	a, b, c, d, e, f	
1	b, c	
2	a, b, d, e, g	
3	a, b, c, d, g	
4	b, c, f, g	
5	a, c, d, f, g	

6	a, c, d, e, f, g	
7	a, b, c	
8	a, b, c, d, e, f, g	
9	a, b, c, d, f, g	

Table 4.20

From the above table we can determine the truth table for BCD-to-7 segment decoder/driver. This truth table also depends on the construction of 7-segment display. If 7-segment display is common anode, the segment driver output must be active low to glow the segment. In case of common cathode type 7-segment display, the segment driver output must be active high to glow the segment. Table 4.21 shows the truth tables for both BCD-to 7 segment decoder/driver with common anode display and with common cathode display.

Digit	A	B	C	D	a	b	c	d	e	f	g
0	0	0	0	0	1	1	1	1	1	1	0
1	0	0	0	1	0	1	1	0	0	0	0
2	0	0	1	0	1	1	0	1	1	0	1
3	0	0	1	1	1	1	1	1	0	0	1
4	0	1	0	0	0	1	1	0	0	1	1
5	0	1	0	1	1	0	1	1	0	1	1
6	0	1	1	0	1	0	1	1	1	1	1
7	0	1	1	1	1	1	1	0	0	0	0
8	1	0	0	0	1	1	1	1	1	1	1
9	1	0	0	1	1	1	1	1	0	1	1

Table 4.21 Truth table for BCD-to-common-cathode 7-segment decoder/driver

...ogic simplification

For a

AB \ CD	00	01	11	10
00	1	0	1	1
01	0	1	1	1
11	X	X	X	X
10	1	1	X	X

$a = A + C + BD + \overline{B}\,\overline{D}$

For b

AB \ CD	00	01	11	10
00	1	1	1	1
01	1	0	1	0
11	X	X	X	X
10	1	1	X	X

$b = \overline{B} + \overline{C}\,\overline{D} + CD$

For c

AB \ CD	00	01	11	10
00	1	1	1	0
01	1	1	1	1
11	X	X	X	X
10	1	1	X	X

$c = B + \overline{C} + D$

For d

AB \ CD	00	01	11	10
00	1	0	1	1
01	0	1	0	1
11	X	X	X	X
10	1	1	X	X

$d = \overline{B}\,\overline{D} + C\overline{D} + B\overline{C}D + \overline{B}C + A$

For e

AB \ CD	00	01	11	10
00	1	0	0	1
01	0	0	0	1
11	X	X	X	X
10	1	0	X	X

$e = \overline{B}\,\overline{D} + C\overline{D}$

For f

AB \ CD	00	01	11	10
00	1	0	0	0
01	1	1	0	1
11	X	X	X	X
10	1	1	X	X

$f = A + \overline{C}\,\overline{D} + B\overline{C} + B\overline{D}$

For g

AB \ CD	00	01	11	10
00	0	0	1	1
01	1	1	0	1
11	X	X	X	X
10	1	1	X	X

$g = A + B\,\overline{C} + \overline{B}\,C + C\,\overline{D}$

Fig. 4.68

Logic diagram