

ASSIGNMENT-4

Dtd: 7/1/22

Submitted by →

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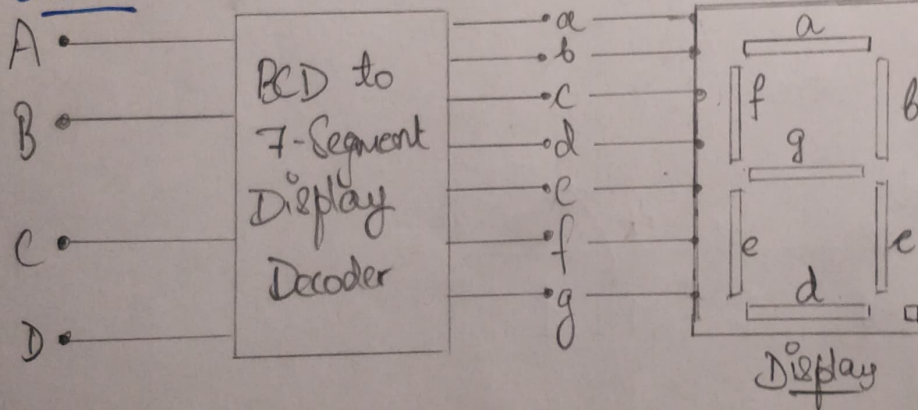
BCD to 7-Segment Decoder

AIM → To get familiar with 7-Segment Display Decoder and calculate the expressions for its terminals.

SOFTWARE USED → Logisim.

THEORY →

Scheme:



→ A segment glows whenever it gets high logic (1).
From this information, we can easily construct the following truth table:

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

Example -

(5)

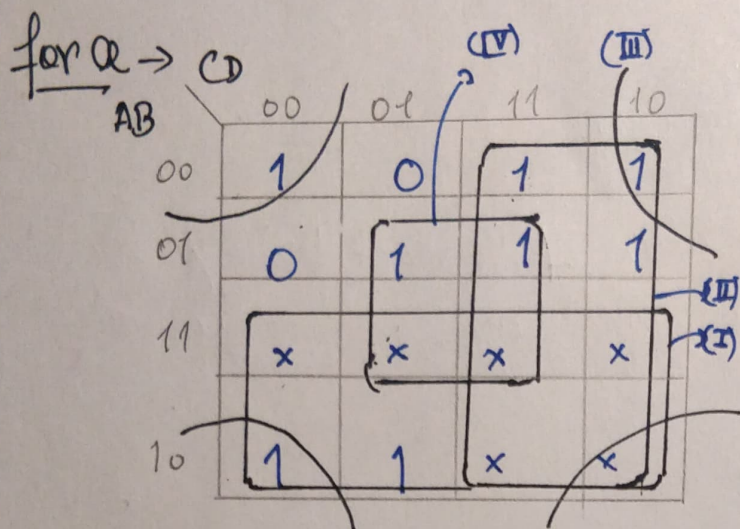
a

f g

d

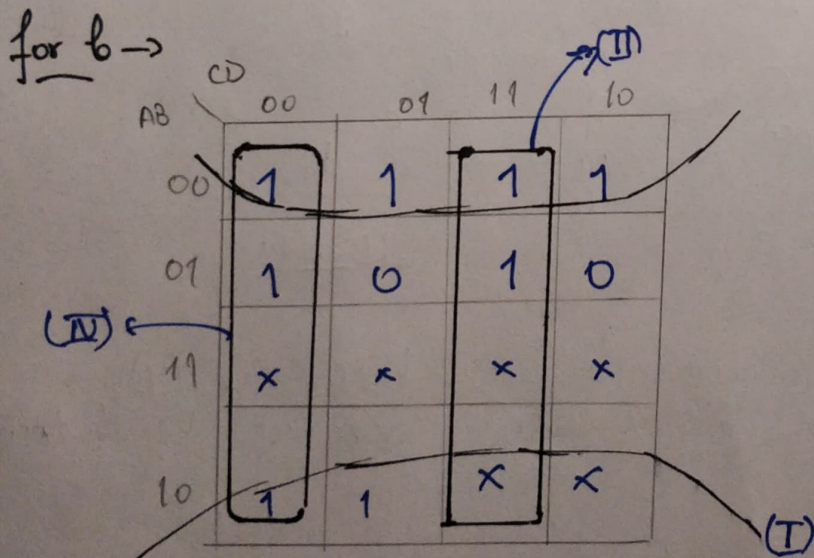
c

⇒ only b, c = 0



$$a = A + C + \bar{B}\bar{D} + BD \equiv A + C + \overline{B \oplus D}$$

(I)
(II)
(III)
(IV)



$$b = \bar{B} + CD + \bar{C}\bar{D} \equiv \bar{B} + \overline{C \oplus D}$$

(I)
(II)
(III)

for $C \rightarrow$

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

Groupings: (I) covers (00,01) in row 10; (II) covers (00,01) in row 00; (III) covers (01,11) in row 01; (IV) covers (11,10) in row 10.

$$C = \underbrace{\bar{C}}_{(I)} + \underbrace{CD}_{(II)} + \underbrace{B}_{(III)}$$

$$C = \bar{C} + D + B$$

(since $x + x'a = x + a$)

for $d \rightarrow$

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

Groupings: (I) covers (00,01) in row 10; (II) covers (01,11) in row 01; (III) covers (11,10) in row 10; (IV) covers (00,01) in row 00.

$$d = \underbrace{A}_{(I)} + \underbrace{C\bar{D}}_{(II)} + \underbrace{\bar{B}\bar{D}}_{(III)} + \underbrace{B\bar{C}D}_{(IV)} + \bar{B}CD$$

$$= A + C\bar{D} + \bar{B}\bar{C}D + \bar{B}(CD + \bar{D})$$

$$d = A + C\bar{D} + \bar{B}C + \bar{B}\bar{D} + B\bar{C}D$$

(since $x + x'a = x + a$)

for $e \rightarrow$

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

Groupings: (I) covers (00,10), (01,10) in column CD=10. (II) covers (00,01), (10,01) in row AB=01.

$$e = c\bar{d} + \bar{b}\bar{d}$$

(I) (II)

for $f \rightarrow$

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

Groupings: (I) covers (00,10), (01,10) in row AB=10. (II) covers (00,01), (01,01) in column CD=00. (III) covers (00,01), (10,01) in row AB=01. (IV) covers (01,01), (10,01) in column CD=01.

$$f = A + B\bar{d} + \bar{c}\bar{d} + B\bar{c}$$

(I) (II) (III) (IV)

for $g \rightarrow$

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

Groupings: (I) covers (00,10), (01,10) in row AB=10. (II) covers (00,01), (01,01) in column CD=00. (III) covers (00,01), (10,01) in row AB=01. (IV) covers (01,01), (10,01) in column CD=01.

$$g = A + B\bar{c} + c\bar{d} + \bar{b}c$$

(I) (II) (III) (IV)

$$g = A + B \oplus C + c\bar{d}$$

