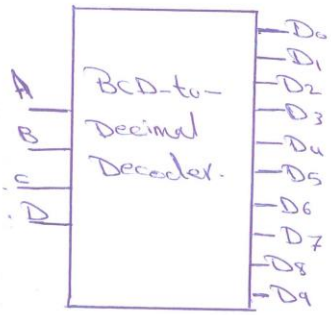
2- BCD to Decimal Decoders:-

The BCD decoder converts each BCD code (8421) into one of the possible decimal digit-indications it is referred to as 4-line-to-10-line decoder or a 4-to-10 decoder. A list of the ten BCD codes and their corresponding decoding functions is given in Table below:-



ABCD	D_0	D_1	D_2	D_3	D_4	D_5	D_6	D_7	D_8	D_9
0000	1	0	0	0	0	0	0	0	0	0
0001	0	1	0	0	0	0	0	0	0	0
0010	0	0	1	0	0	0	0	0	0	0
0011	0	0	0	1	0	0	0	0	0	0
0100	0	0	0	0	1	0	0	0	0	0
0101	0	0	0	0	0	1	0	0	0	0
0110	0	0	0	0	0	0	1	0	0	0
0111	0	0	0	0	0	0	0	1	0	0
1000	0	0	0	0	0	0	0	0	1	0
1001	0	0	0	0	0	0	0	0	0	1
1010	X	X	X	X	X	X	X	X	X	X
1011	X									X
1100										
1101										
1110										
1111	X	X	X	X	X	X	X	X	X	X

$D_0 = \bar{A}\bar{B}\bar{C}\bar{D}$
$D_1 = \bar{A}\bar{B}\bar{C}D$
$D_2 = \bar{B}C\bar{D}$
$D_3 = \bar{B}CD$
$D_4 = B\bar{C}\bar{D}$
$D_5 = B\bar{C}D$
$D_6 = BC\bar{D}$
$D_7 = BCD$
$D_8 = A\bar{D}$
$D_9 = AD$

don't care $= \sum 10, 11, 12, 13, 14, 15$

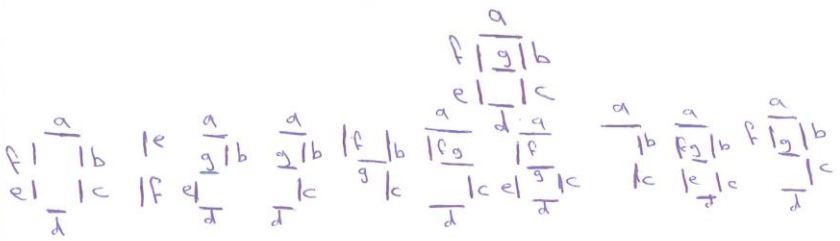
CD \ AB	$\bar{A}\bar{B}$	$\bar{A}B$	AB	$A\bar{B}$
$\bar{C}\bar{D}$	0	4	X_{12}	8
$\bar{C}D$	1	5	X_{13}	9
CD	3	7	X_{15}	X_{11}
$C\bar{D}$	1 (2)	6	X_{14}	X_{10}

$D_2 = \bar{B}C\bar{D}$

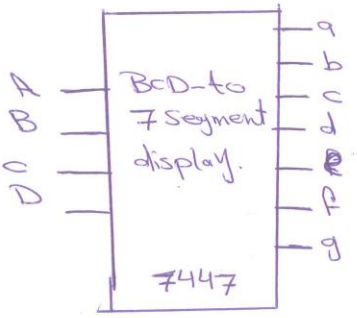
H.w:- Write the K-map for the other D. [D_3 ... D_9]

3- BCD to 7-Segment Decoder:-

This type of decoder accepts the BCD code on its input and provides outputs to drive 7-segment display in order to produce a decimal digital readout.



BCD	a	b	c	d	e	f	g
0000	1	1	1	1	1	1	0
0001	0	0	0	0	1	1	0
0010	1	1	0	1	1	0	1
0011	1	1	1	1	0	0	1
0100	0	1	1	0	0	1	1
0101	1	0	1	1	0	1	1
0110	1	0	1	1	1	1	1
0111	1	1	1	0	0	0	0
1000	1	1	1	1	1	1	1
1001	1	1	1	1	0	1	1
1010	—	—	—	—	—	—	—
1011	X	-	-	-	-	-	X
1100	X						
1101	X						
1110							
1111	X	-	-	-	-	-	X



$a = \sum 0, 2, 3, 5, 6, 7, 8, 9$

$b = \sum 0, 2, 3, 4, 7, 8, 9$

$c = \sum 0, 3, 4, 5, 6, 7, 8, 9$

$d = \sum 0, 2, 3, 5, 6, 8, 9$

$e = \sum 0, 1, 2, 6, 8$

$f = \sum 0, 1, 4, 5, 6, 8, 9$

$g = \sum 2, 3, 4, 5, 6, 8, 9$

don't care $= \sum 10, 11, 12, 13, 14, 15$

Encoder:-

An encoder is a digital circuit that performs the inverse operation of a decoder. An encoder has 2^n (or fewer) input lines and n output lines. An encoder accepts an active level on one of its inputs representing a digit, such as a decimal or octal digit, and converts it to a coded output such as BCD or Binary

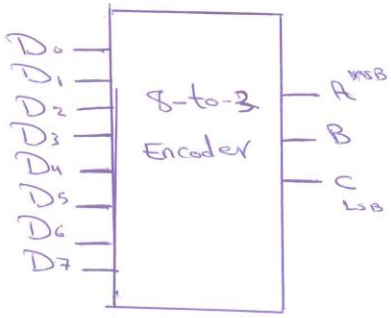
D_0	D_1	D_2	D_3	D_4	D_5	D_6	D_7	A	B	C
1	0	0	0	0	0	0	0	0	0	0
0	1	0	0	0	0	0	0	0	0	1
0	0	1	0	0	0	0	0	0	1	0
0	0	0	1	0	0	0	0	0	1	1
0	0	0	0	1	0	0	0	1	0	0
0	0	0	0	0	1	0	0	1	0	1
0	0	0	0	0	0	1	0	1	1	0
0	0	0	0	0	0	0	1	1	1	1

Truth Table of octal-to-binary Encoder

$A = D_4 + D_5 + D_6 + D_7$

$B = D_2 + D_3 + D_6 + D_7$

$C = D_1 + D_3 + D_5 + D_7$



Logic symbol for octal-to-binary Encoder.

Truth table of Decimal to BCD Encoder

D_0	D_1	D_2	D_3	D_4	D_5	D_6	D_7	D_8	D_9	A	B	C	D
1	0	0	0	0	0	0	0	0	0	0	0	0	0
0	1	0	0	0	0	0	0	0	0	0	0	0	1
0	0	1	0	0	0	0	0	0	0	0	0	1	0
0	0	0	1	0	0	0	0	0	0	0	0	1	1
0	0	0	0	1	0	0	0	0	0	0	1	0	0
0	0	0	0	0	1	0	0	0	0	0	1	0	1
0	0	0	0	0	0	1	0	0	0	0	1	1	0
0	0	0	0	0	0	0	1	0	0	0	1	1	1
0	0	0	0	0	0	0	0	1	0	1	0	0	0
0	0	0	0	0	0	0	0	0	1	1	0	0	1

MSB

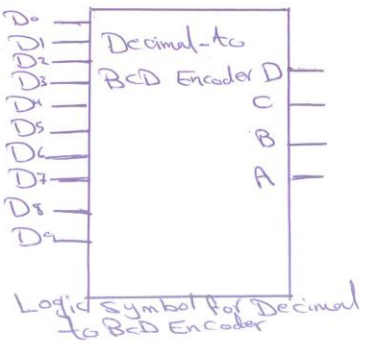
$A = D_8 + D_9$

$B = D_4 + D_5 + D_6 + D_7$

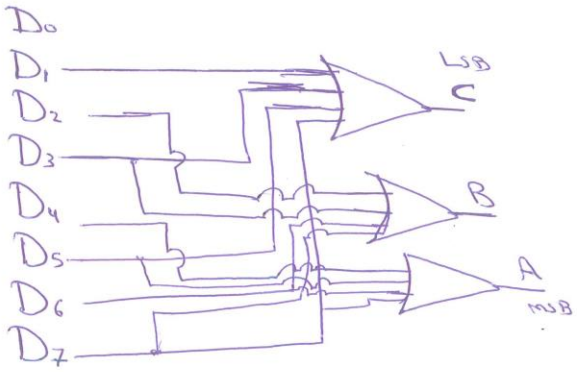
$C = D_2 + D_3 + D_6 + D_7$

$D = D_1 + D_3 + D_5 + D_7$

LSB



Logic Symbol for Decimal to BCD Encoder



Basic logic diagram of a octal to Binary Encoder.

H.W :- Draw the Basic logic diagram of a Decimal to BCD Encoder.

Note:- If two inputs are active simultaneously, the output produces an undefined combination. To resolve this ambiguity, encoder circuits must establish an input priority to ensure that only one input is encoded. If we establish a higher priority for i/p's with higher subscript numbers, and if both D_3 and D_6 are 1 at the same time, the output will be 110 because D_6 has higher priority than D_3.

2016/10/12