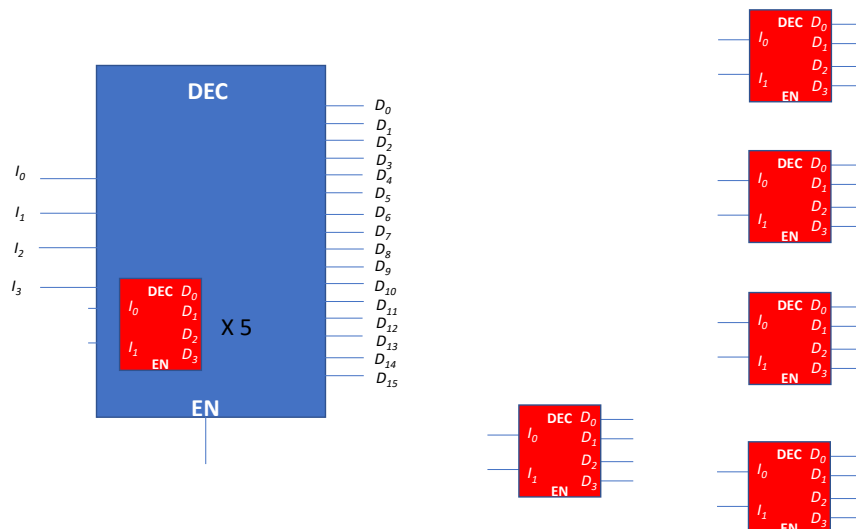
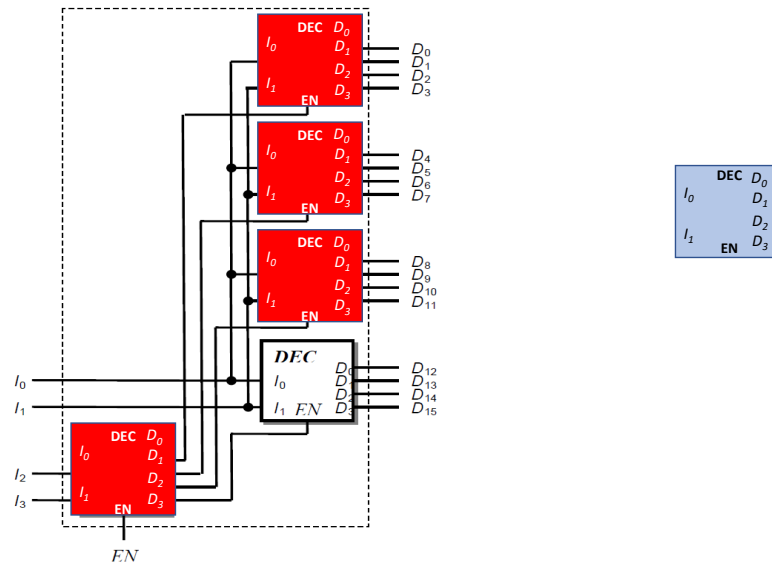


Tut 10

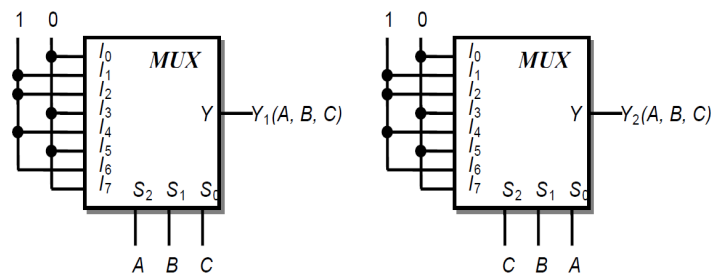
EE 2000

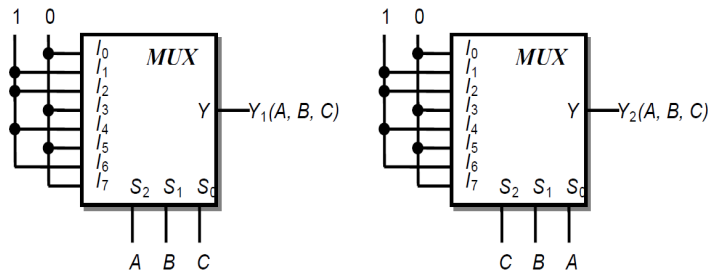
1. Construct a 4 x 16 decoder (with enable input) using five 2 x 4 decoder (with enable input) modules. Show the schematic diagram neatly.





2. For the multiplexer circuits shown in the following figure below, what are $Y_1(A, B, C)$ and $Y_2(A, B, C)$ respectively? Please list in standard sum of products form.





Answer:

A	B	C	Y ₁
0	0	0	0
0	0	1	1
0	1	0	1
0	1	1	0
1	0	0	1
1	0	1	0
1	1	0	1
1	1	1	0

C	B	A	Y ₂
0	0	0	0
0	0	1	1
0	1	0	1
0	1	1	0
1	0	0	1
1	0	1	0
1	1	0	1
1	1	1	0

A	B	C	Y ₂
0	0	0	0
0	0	1	1
0	1	0	1
0	1	1	1
1	0	0	1
1	0	1	0
1	1	0	0
1	1	1	0

$$Y_1(A, B, C) = \sum m(1, 2, 4, 6)$$

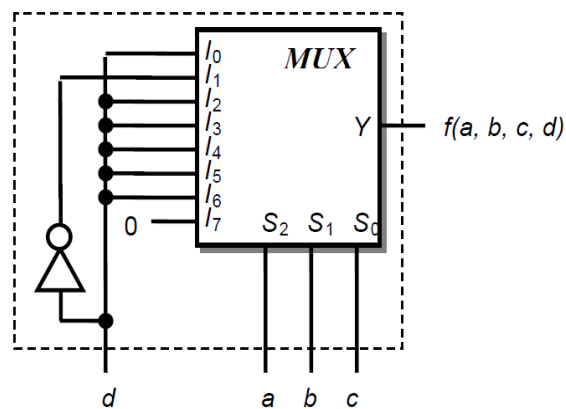
3. Implement the function $f(a, b, c, d) = \sum m(1, 2, 5, 7, 9, 11, 13)$ using:

- A 8-to-1-line multiplexer and a NOT gate only
- A 2-to-1-line multiplexer and minimum number of AND, OR, NOT gates

(Hints: Assign variable a as selection input of the MUX, and then express f as a function of b, c, d with the help of K-map)

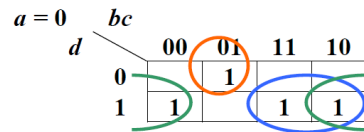
Answer (a) :

a	b	c	d	f
0	0	0	0	0
0	0	0	1	1
0	0	1	0	1
0	0	1	1	0
0	1	0	0	0
0	1	0	1	1
0	1	1	0	0
0	1	1	1	1
1	0	0	0	0
1	0	0	1	1
1	0	1	0	0
1	0	1	1	1
1	1	0	0	0
1	1	0	1	1
1	1	1	0	0
1	1	1	1	0

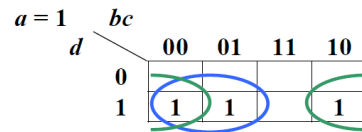


Answer (b) :

Select **a** as the selection variable for MUX



$$f = bd + \underline{c'd} + b'cd'$$



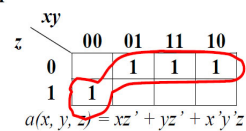
$$f = b'd + \underline{c'd} \quad (\text{found a common term: } c'd)$$

4. Draw the PAL diagram for the following truth table. **Answer:**

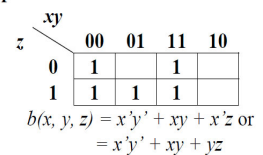
Inputs			Outputs			
<i>x</i>	<i>y</i>	<i>z</i>	<i>a</i>	<i>b</i>	<i>c</i>	<i>d</i>
0	0	0	0	1	0	0
0	0	1	1	1	1	1
0	1	0	1	0	1	1
0	1	1	0	1	0	1
1	0	0	1	0	1	0
1	0	1	0	0	0	1
1	1	0	1	1	1	0
1	1	1	0	1	1	1

1. Simplify the output in *SOP*. Minimum the number of product terms.

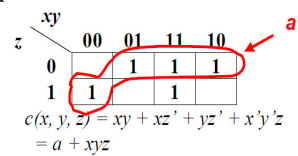
Output *a*:



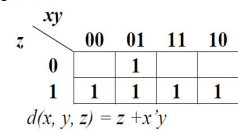
Output *b*:



Output *c*:



Output *d*:



Output a:

xy		00	01	11	10
z	0		1	1	1
	1	1			

$a(x, y, z) = xz' + yz' + x'y'z$

Output c:

xy		00	01	11	10
z	0		1	1	1
	1	1		1	

$c(x, y, z) = xy + xz' + yz' + x'y'z$
 $= a + xyz$

Output b:

xy		00	01	11	10
z	0	1		1	
	1	1	1	1	

$b(x, y, z) = x'y' + xy + x'z$ or
 $= x'y' + xy + yz$

Output d:

xy		00	01	11	10
z	0		1		
	1	1	1	1	1

$d(x, y, z) = z + x'y$

