

Solutions for Midterm

(Question 1 only!)

CSE 370

a)

A	B	C	D	E
0	0	0	0	0
0	0	1	0	1
0	1	0	1	0
0	1	1	1	1
1	0	0	X	X
1	0	1	1	1
1	1	0	1	0
1	1	1	0	1

b)

$$D = \sum m(2,3,5,6) + d_4 = \sum m(0,1,7) * D_4$$

$$E = \sum m(1,3,5,7) + d_4 = \sum m(0,2,6) * M_4$$

c)

D(a,b,c)

AB	00	01	11	10
C				
0	0	1	1	X
1	0	1	0	1

E(a,b,c)

AB C	00	01	11	10
0	0	0	0	X
1	1	1	1	1

Minimized Expressions

$$D = a'b + ab' + bc' \text{ (SoP)}$$

$$= (a+b)(a'+b'+c') \text{ (PoS)}$$

$$E = c \text{ (both PoS and SoP)}$$

Minimum PoS expression for D =

$$(a+b)(a'+b'+c') = (a+b+c)(a+b+c')(a'+b'+c') \text{ (unification)}$$

$$= PM(0,1,7) \text{ as required.}$$

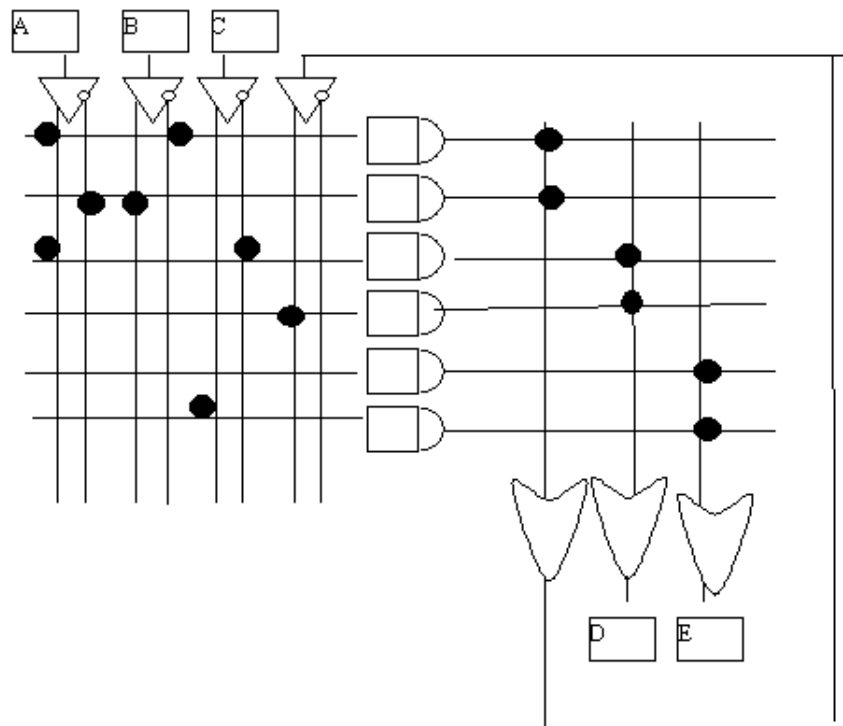
d)

The minimization done above does NOT contain a single-bit static-1 hazard. Note that the adjacent cells 110 & 100 even though not covered by the same prime implicant will still not result in a static-1 bit hazard as the transition is between a *don't-care* and a 1.

One implementation, which will have static-1 hazard, would be

$$D = a'b + ab' + ac'$$

In which there is hazard between 100 & 110. If you try to remove this hazard by adding another prime implicant $a'c$ the hazard will surely go away but however this function ($D = a'b + ab' + ac' + a'c$) will no longer remain implementable using the PAL as even after using feedback, at most **three** product terms can be added using feedback once. (Feedback cannot be used twice else there would be no place left for E).



$$D = a'b + ab' + a'c$$

$$E = c$$

Implementation Using PLA

