



Above figure represents the intersection of a main highway with a secondary access road. Vehicle detection sensor are placed along lanes C & D (main road) and lanes A & B (access road). These sensor outputs are LOW when no vehicle is present and at least one sensor output is High when a vehicle is present. So Write down the logics of controlling the intersection traffic light that no accident will occur. Then using the sensor outputs design a logic circuit to control the traffic light.

Solution:

1. Logics of controlling intersection of traffic light:

- 1) The east-west(E-W) traffic light will be green whenever both lanes C and D are occupied.
- 2) The E-W light will be green whenever either C or D is occupied but lanes A and B are not both occupied.
- 3) The north-south(N-S) light will be green whenever both lanes A and B are both occupied but C and D are not both occupied.
- 4) The N-S light will also be green when either A or B is occupied while C and D are both vacant.
- 5) The E-W light will be green when no vehicles are present.

We consider output 1 for green light and 0 for the other.

3. MAP:

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

Fig: Map for N-S

$$N - S = BC'D' + AC'D' + ABC' + ABD'$$

or

$$N - S = C'D'(A + B) + AB(C' + D')$$

Look at the truth table, The output of E-W is just opposite of the output of N-S. So we can write the following equation for E-W:

$$E - W = (N - S)'$$

2. Truth Table :

Inputs				Outputs	
A	B	C	D	N-S	E-W
0	0	0	0	0	1
0	0	0	1	0	1
0	0	1	0	0	1
0	0	1	1	0	1
0	1	0	0	1	0
0	1	0	1	0	1
0	1	1	0	0	1
0	1	1	1	0	1
1	0	0	0	1	0
1	0	0	1	0	1
1	0	1	0	0	1
1	0	1	1	0	1
1	1	0	0	1	0
1	1	0	1	1	0
1	1	1	0	1	0
1	1	1	1	0	1

4. Circuit Diagram :

