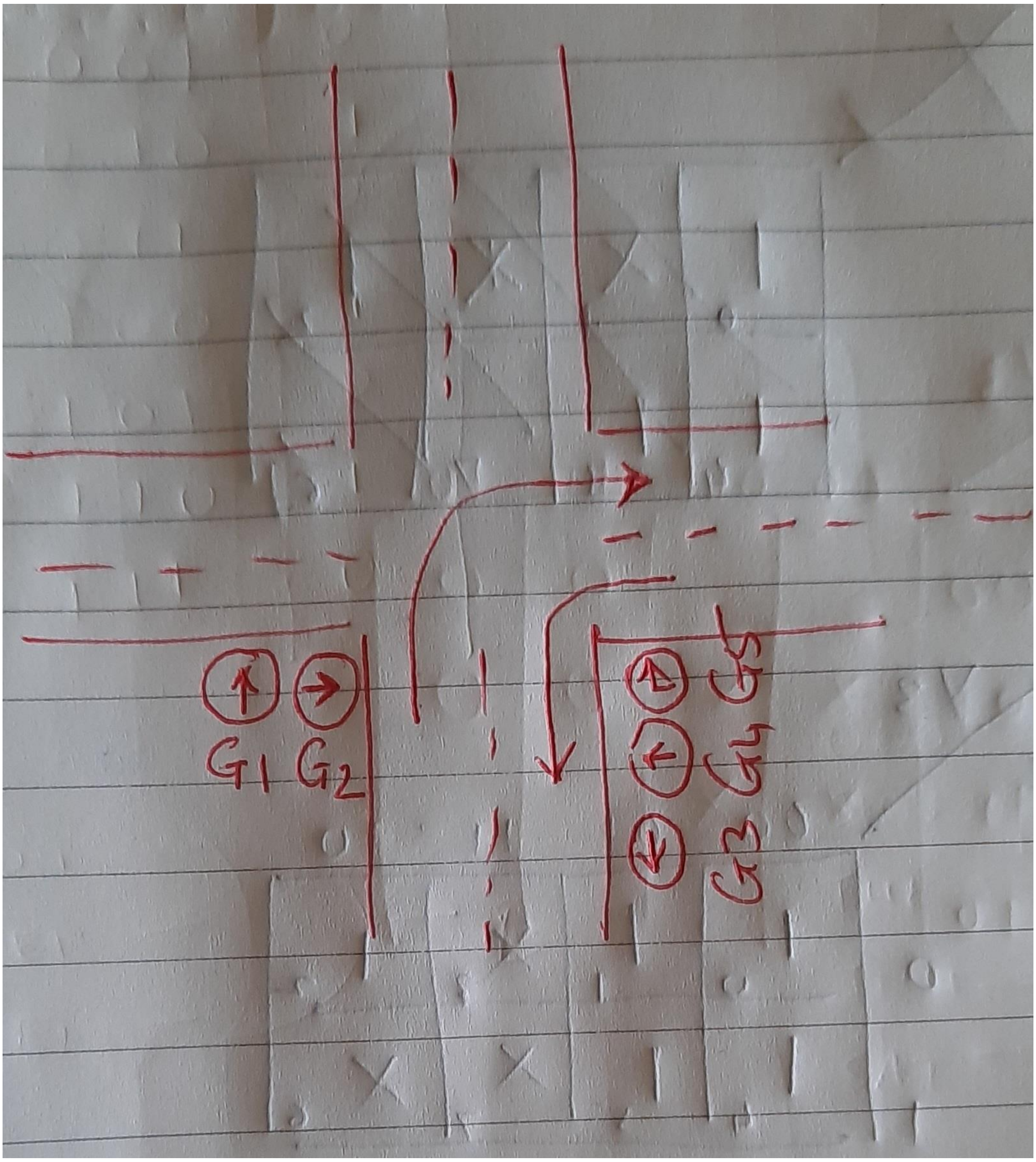
K-maps with don’t care conditions

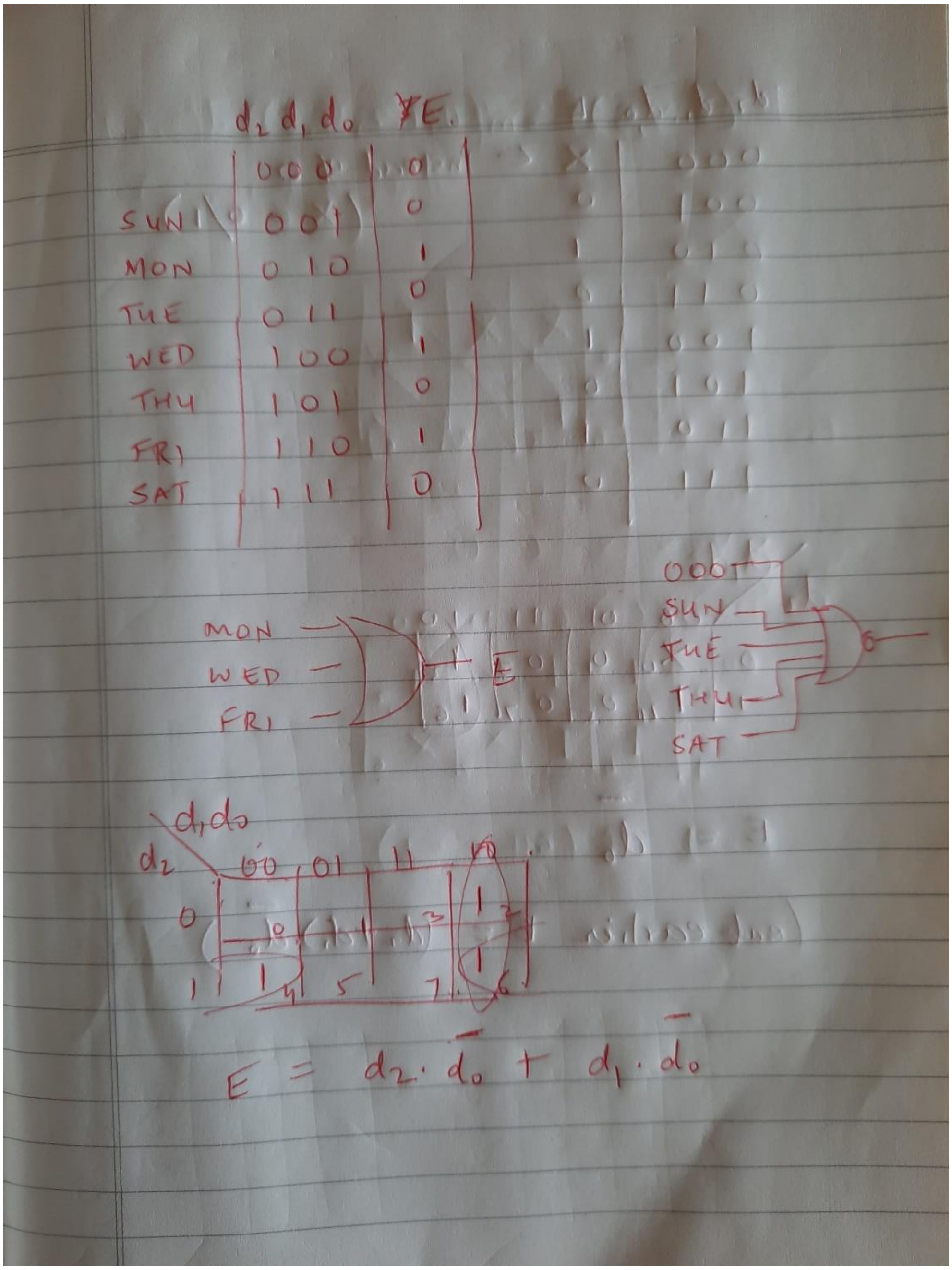
Concept of don’t care

(a) Consider the traffic signal below:

G1 and G3 are independent of each other. Therefore G1 is a “don’t care” as far as G3 is concerned i.e. for G3 it doesn’t matter whether G1 is red or green.



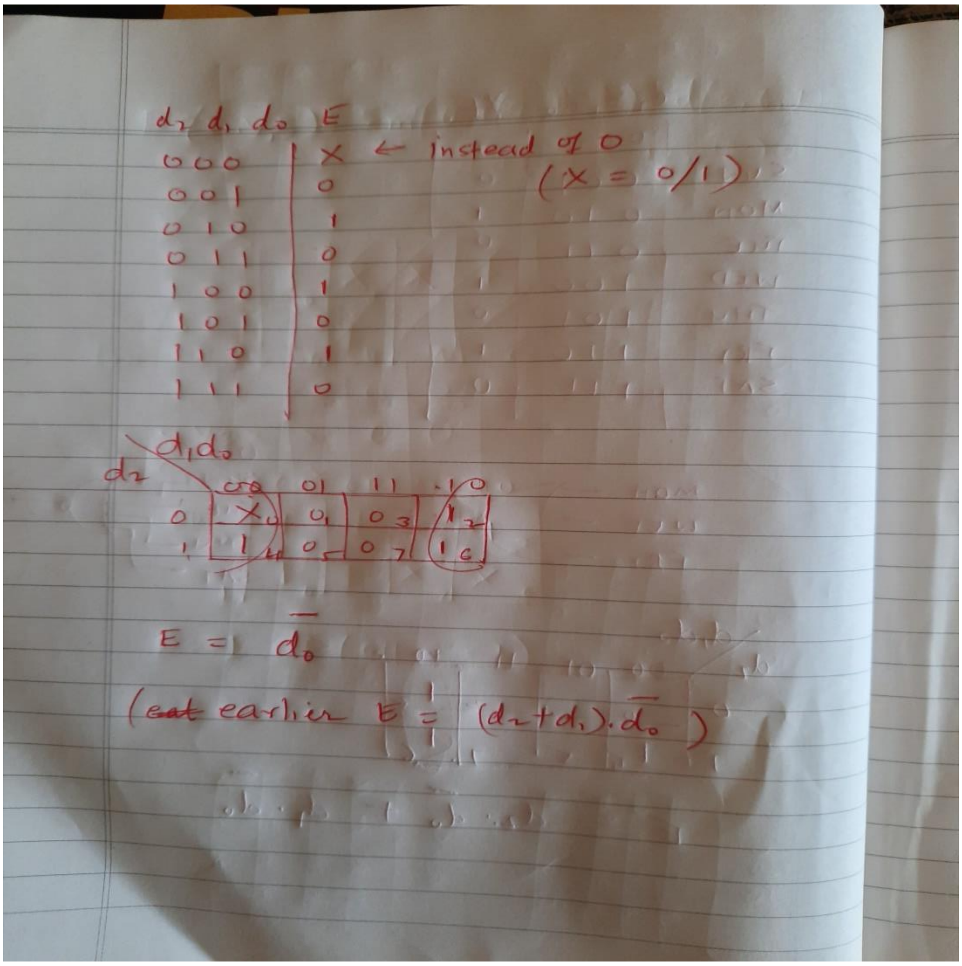
(b) Consider a case where an alarm E has to be activated only on Mon, Wed and Fri. In the following diagram **d2d1d0** indicate the 3 bit day code. The logic diagram for E is shown below:



In this case E = d2.d0’ + d1.d0’

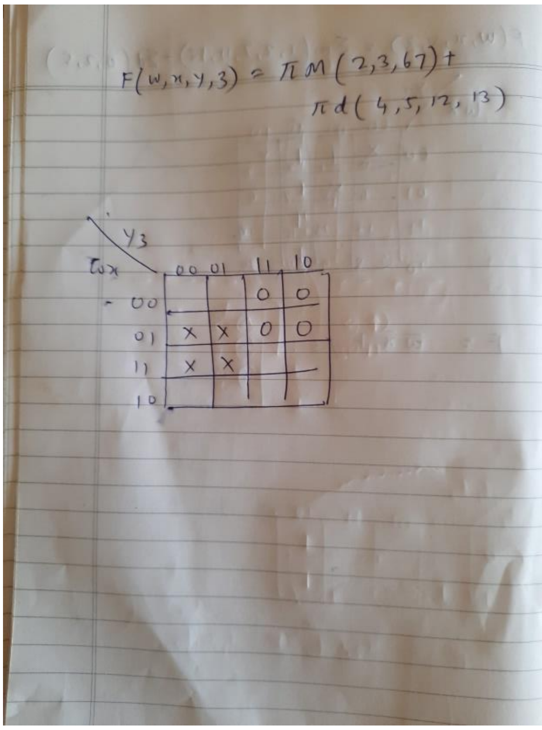
However there are only 7 days in a week, so the condition **d2d1d0=000** will never occur. Therefore we can use this to our advantage and make this row in the truth table 0 or 1 as per our convenience.

In other words the minterm m0 is a don’t care.



Note that by making m0 = x (don’t care) we have simplified the logic for E to **E = d0’**.

Some examples are solved; others have been discussed in class.



$F(w, x, y, z) = \sum m(1, 3, 7, 11, 15) + \sum d(0, 2, 5)$

$wx \backslash yz$	00	01	11	10
00	X 0	1 1	1 3	X 2
01	4	X 5	1 7	6
11	12	13	1 15	14
10	8	9	1 11	10

$F = \bar{w}\bar{x} + yz$.

$F(x,y,z) = \Sigma m(0,1,2,4,5) + d(3,6,7)$

1 $_0$	X $_1$	X $_3$	1 $_2$
1 $_4$	1 $_5$	$_7$	$_6$

$x \backslash yz$	00	01	11	10
0	1 $_0$	1 $_1$	X $_3$	1 $_2$
1	1 $_4$	1 $_5$	X $_7$	X $_6$

F = 1 if (all x = 1)

$$F(w, x, y, z) = \Pi M(0, 2, 8, 10) + \Pi d(1, 3)$$

$wx \backslash yz$	00	01	11	10
00	0	X	X	0
01				
11				
10	0			0