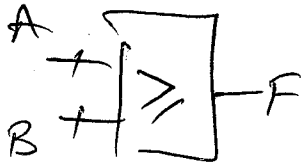
# Practise exam solutions

**Q1** $A = \{a_1, a_0\}$

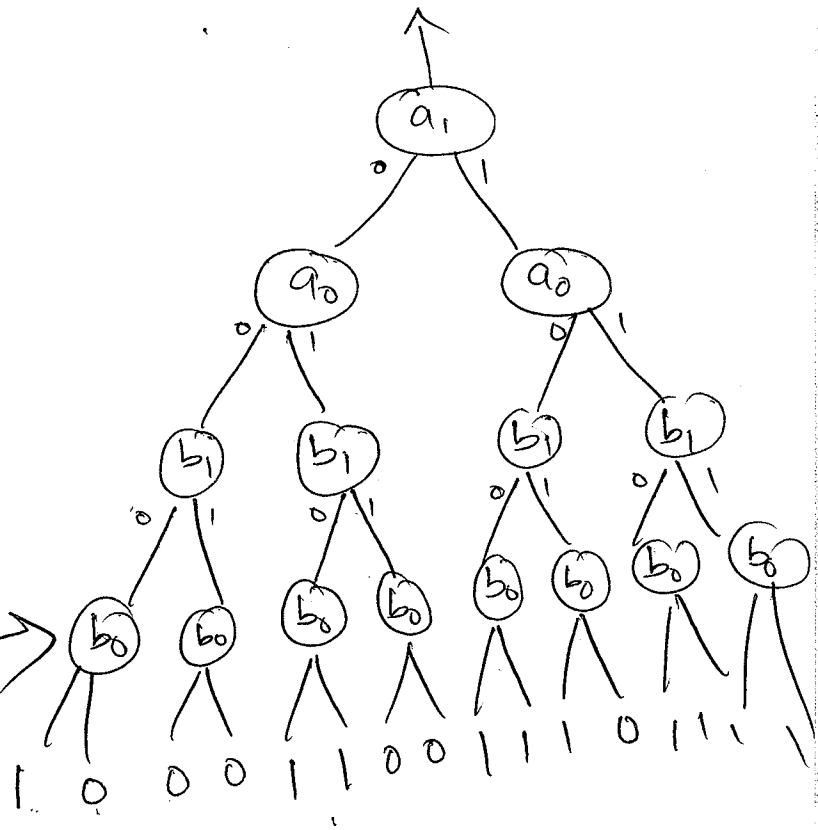
$B = \{b_1, b_0\}$

$F = (A \geq B)$




Design the ckt using MUX. only

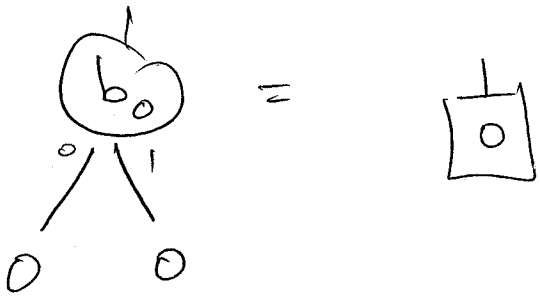
| $a_1$ $a_0$ | $b_1$ $b_0$ | F |
|---|---|---|
| 0 0 | 0 0 | 1 |
| 0 0 | 0 1 | 0 |
| 0 0 | 1 0 | 0 |
| 0 0 | 1 1 | 0 |
| 0 1 | 0 0 | 1 |
| 0 1 | 0 1 | 1 |
| 0 1 | 1 0 | 0 |
| 0 1 | 1 1 | 0 |
| 1 0 | 0 0 | 1 |
| 1 0 | 0 1 | 1 |
| 1 0 | 1 0 | 1 |
| 1 0 | 1 1 | 0 |
| 1 1 | 0 0 | 1 |
| 1 1 | 0 1 | 1 |
| 1 1 | 1 0 | 1 |
| 1 1 | 1 1 | 1 |



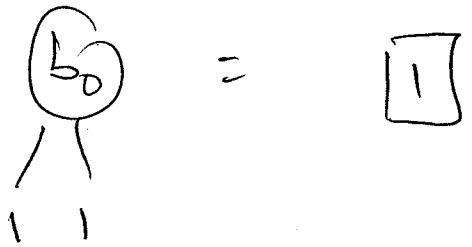

Recall, truth table = Binary Decision Tree

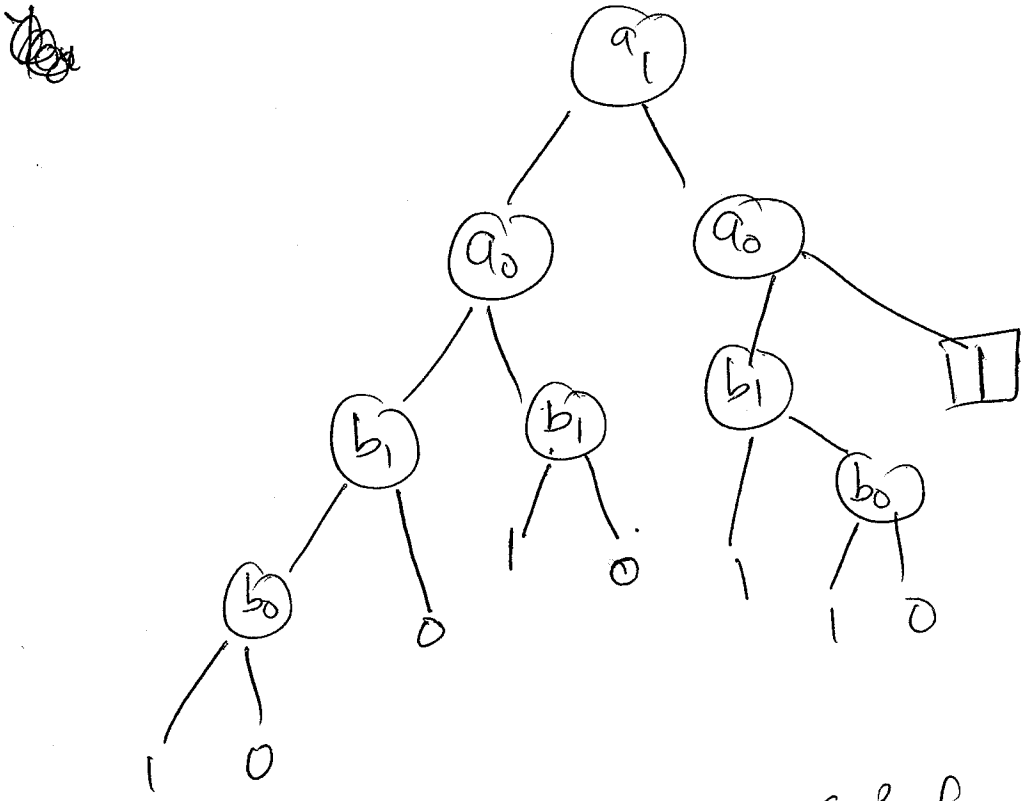
Each node in the tree is a MUX

Note: → I can optimize this tree.




If both inputs to the MUX = x ↓ then f = x



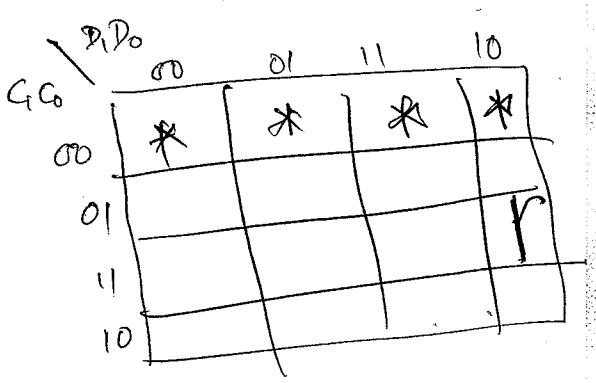

You could, of course, write an SOP form & then use K-maps & then implement the ckt using MUX ..... but this is easier.

Q2 → Primes you can solve for yourself.

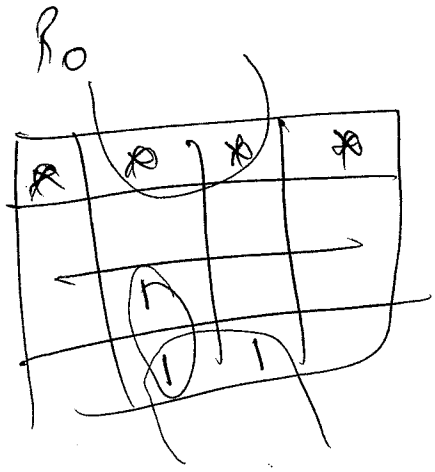
Q3 $R = D \% C$

| $D_1$ | $D_0$ | $C_1$ | $C_0$ | $R_1$ | $R_0$ |
|---|---|---|---|---|---|
| 0 | 0 | 0 | 0 | * | * |
| | | 0 | 1 | 0 | 0 |
| | | 1 | 0 | 0 | 0 |
| | | 1 | 1 | 0 | 0 |
| 0 | 1 | 00 | | x | x |
| | | 01 | | 0 | 0 |
| | | 10 | | 0 | 1 |
| | | 11 | | 0 | 1 |
| 1 | 0 | 00 | | x | x |
| | | 01 | | 0 | 0 |
| | | 10 | | 0 | 0 |
| | | 11 | | 1 | 0 |
| 11 | | 00 | | x | x |
| | | 01 | | 0 | 0 |
| | | 10 | | 0 | 1 |
| | | 11 | | 0 | 0 |

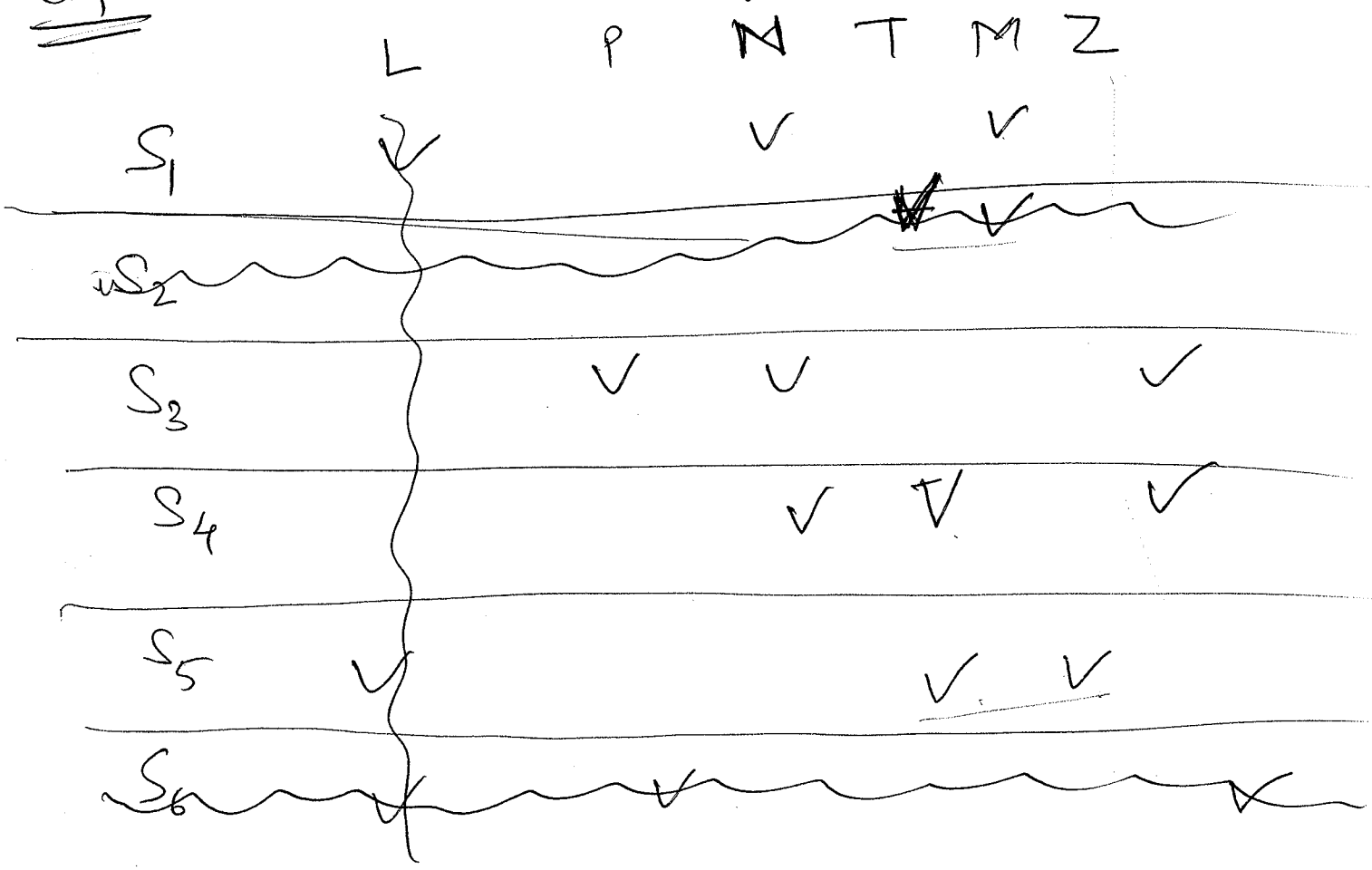
$R_1$




$R_0$



Q4 This is a variation of the QM problem.




$S_5 > S_2$ remove $S_2$

(1)

$S_5 + S_3$

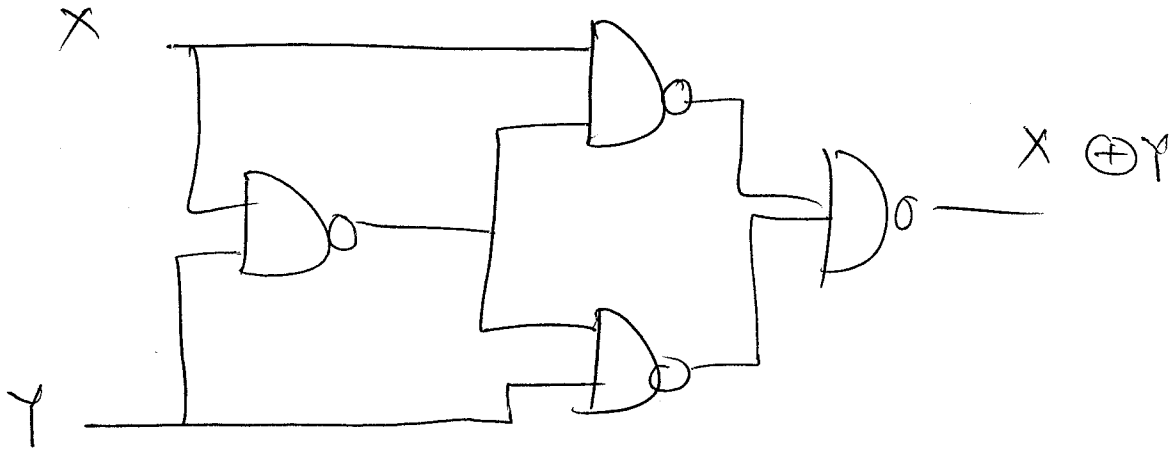
(2) $L > M$ remove L

(3) $S_3 > S_6$ remove $S_6$

$S_3$ = essential. (P, N, Z covered)

$S_5$ covers T & M (and also L)

Q5.




4-nand gates.

How many gates would be needed to design $X \oplus Y$ using only NOR gates??

4? or 5? Try it out!

Q6

PDN gives us $\overline{F}$

$\overline{F}$ = (a) in series with (b in parallel with (c series d))

$= (a) \cdot [b + cd]$

$$F = \overline{\overline{F}} = \overline{a\,[b + cd]}$$

$$= \bar{a} + \overline{[b + cd]}$$

$$= \bar{a} + [\bar{b} \cdot \overline{(cd)}]$$

$$F = \bar{a} + [\bar{b} \cdot (\bar{c} + \bar{d})]$$

+ = parallel

• = series.