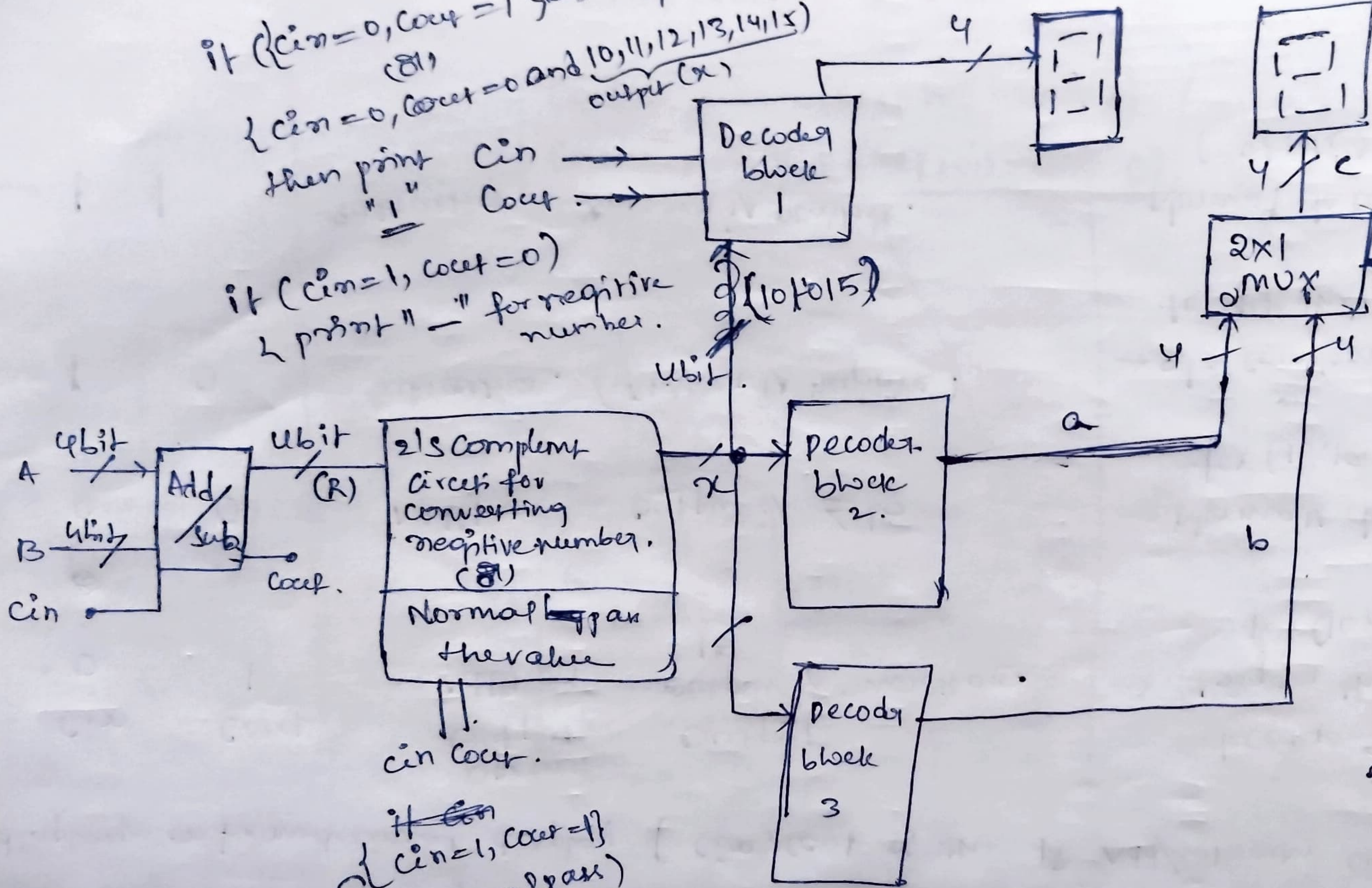
Decoding the Calculator circuit

* The main idea. is depend on Cin, Cout, We are decoding the Output and displays on hexadecimal display. [Cin, Cout of the Add/subtractor circuit].

Cin	Cout	~~Output~~ Operation	Output	decoders need to activate
→ 0	1	→ Addition	output is more than 15	→ trigger the bypass circuit for (16, 17, 18)
→ 0	0	→ Addition	output is ≤ 15	→ Normal decoding circuit ~~for (10, 15.~~ (0 to 15)
→ 1	0	→ Subtraction.	(Answer is negative)	→ 2's complement the answer to get the actual value.
→ 1	1	→ Subtraction	Answer is positive.	→ Normal decoding circuit. (0 to 15)

if ({cin=0, Cout=1} → output > 15)
(or)
{cin=0, Cout=0 and $\underbrace{10,11,12,13,14,15}_{\text{output }(x)}$)
then print "1"

if (cin=1, Cout=0)
{ print "–" for negitive number.



cin Cout.

~~if~~
{cin=1, Cout=1}
→ (Normal pass)
{cin=0, Cout=0}
→ [2's (R)].

if (cin=0, Cout=1)
{answer (x) > 15}
(bypass the circuit
i.e $\boxed{C=b}$ }
and (T=1)
~~if~~.
else
cin=0, Cout=0.
{ answer (x) < 15
then "(T=0)"
$\boxed{C=a}$ }.

Decoder block 2 :- it will Just a Normal decode circuit which decodes.

$$\left.\begin{array}{l}0 \longrightarrow 0\\1 \longrightarrow 1\\2 \longrightarrow 2\\3 \longrightarrow 4\\ \vdots \\9 \longrightarrow 9\\10 \longrightarrow 0\\11 \longrightarrow 1\\12 \longrightarrow 2\\13 \longrightarrow 3\\14 \longrightarrow 4\\15 \longrightarrow 5\end{array}\right\}$$ 4bit data as output.

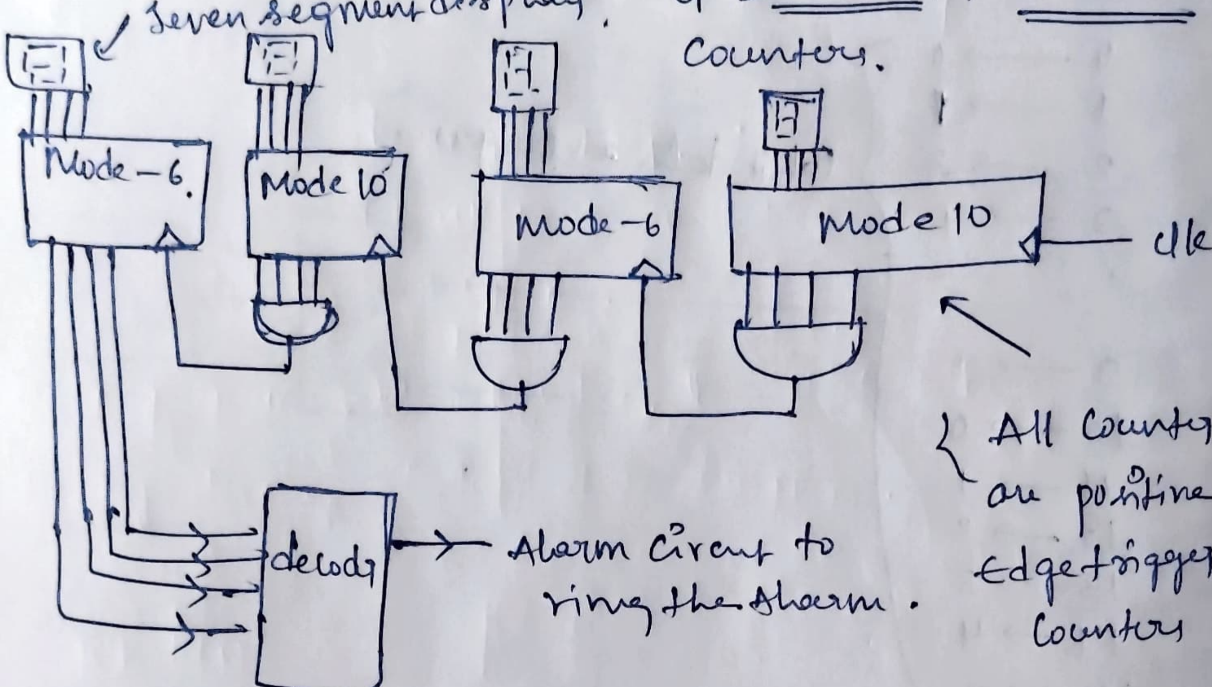
Decoder block 3 :- usefully when $(x > 15)$

10000 (16) → [0000] (6).

10001 (17) → [0001] (7) (4bit data)

10010 (18) → [1000] (8).

Decoding Counter Circuit:— it is Just a Combination of "2-Mode-10", "2-Mode-6" Counters.



* All AND gate will produce "1" as output where Counter values = 0. Otherwise, Output of AND gate = "0".

initial Value of Counters = 0, ∴ All AND gates initial output = 1.

xxx imp point.

Because of positive Edge trigger flipflop, the Counters will increment the value by "1" when a signal goes "(low to high)" at the clk input of counter Not "(high to low)"

When Counter goes, 0 to rest values, the output of AND gate will be high to low ⌝ (No increment in Counter value).

When the Counter will increment ?

for Mode 10 counter

When Count Value goes from 9 to "0". it means.

output of AND gate goes low to high [positive edge trigger]

So the corresponding connected counter will increment.

Similarly for Mode 6 Counter.

When the count value goes from "5" to "0". similar thing will happen. this is how ~~Counter~~ Alarm circuit will work.