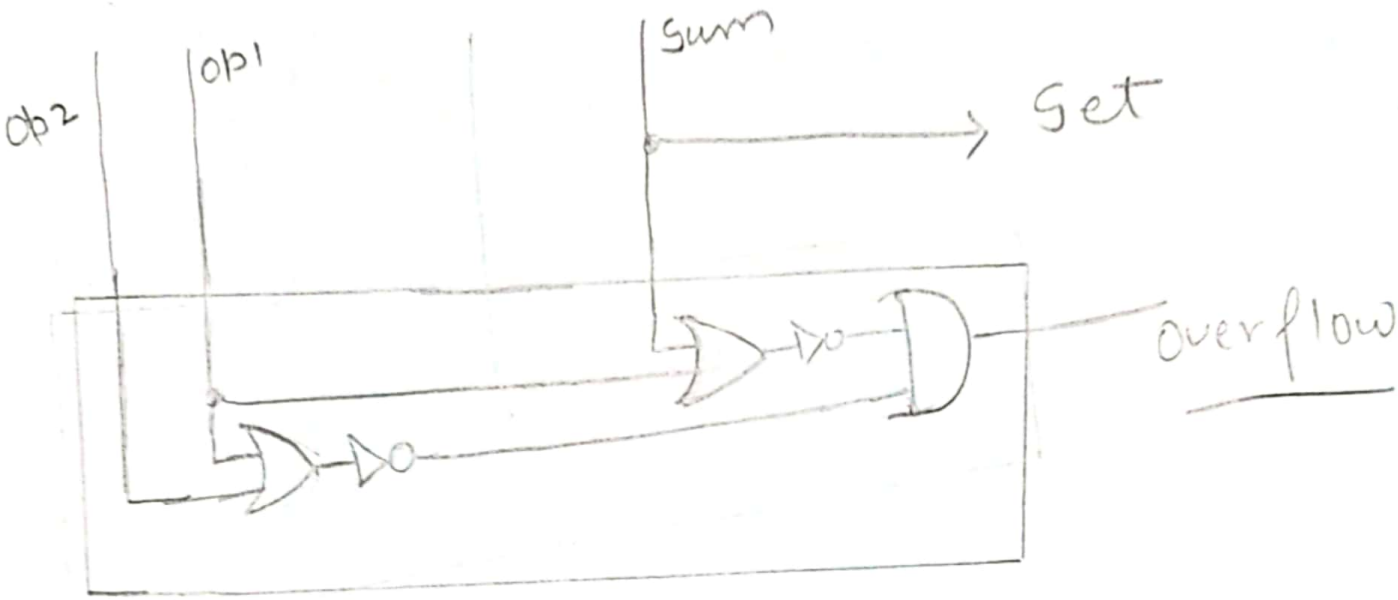
HARSH MOHAN SASON

1.)



Overflow detection

2.) T.P => if ('carry_in to sign_bit' != 'carry-out from sign_bit') → OF

To check whether there is an overflow or not, we need to check the following cases:

1.) adding 2 positive #s → sum is negative #
2.) adding 2 negative #s → sum is positive #

Example for 1.) 4 + 5 ⇒

$$\begin{array}{r} 0100 \\ +\ 0101 \\ \hline 1001 \end{array}$$

Here we get a -ve # because most left bit is 1.

This occured because 4 bit #'s represent from (-8 to 7) and 9 is a 5 bit #. 1001 when taken it two's complement, we get

$$1001 \Rightarrow 0110 \Rightarrow 0110$$
$$+\ 1$$
$$0111 \rightarrow \text{which is 7, causing an overflow}$$

2.] $-8 + (-1) = -9$

$$1000$$
$$+\ 1111$$
$$\textcircled{1}\ 0111$$

0111 is (+7), thus resulting in a +ve #, causing an overflow.

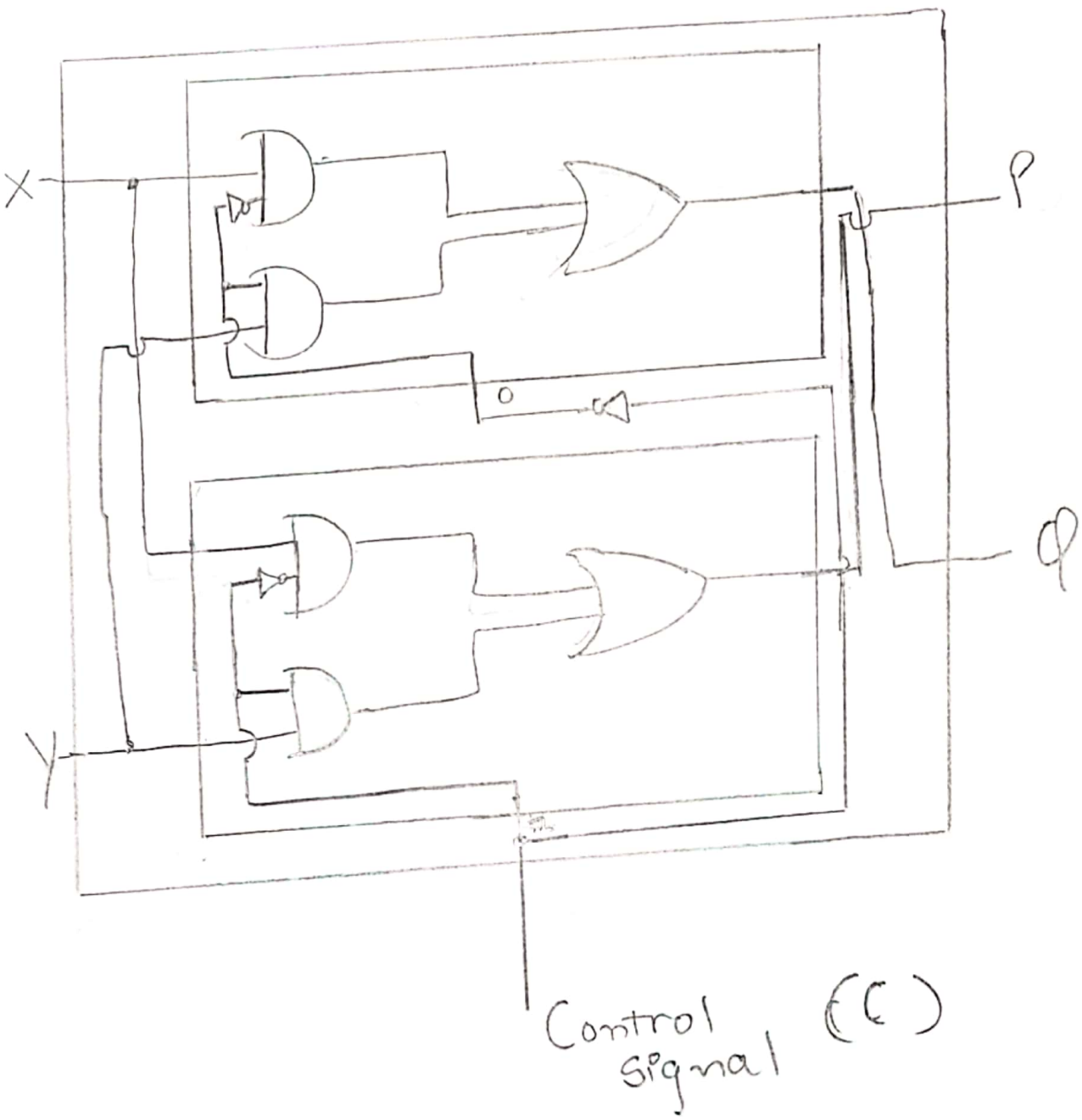
* When two unsigned numbers are added, overflow occurs if there is any carry out on the left most bit.

$8 + 8 = 1000$

$$1000$$
$$\textcircled{1}\ 0000$$

causing an unsigned of

3.)



4.] Amdahl's law: This law shows how much latency can be taken out of a performance task by introducing parallel computing. In other words, it is a formula used to find the maximum improvement possible by just improving a particular part of the system.

Speedup: It is defined as the ratio of performance for the entire task using the enhancement and performance for the entire task without using enhancement.

$$\text{Speedup} = Pe / Pw$$
$$\text{or}$$
$$Ew / Ee$$

where Pe is the performance for entire task using the enhancement when possible, Pw is the performance for entire task without using enhancement, Ew is the execution time for entire task without enhancement and Ee is the execution time for entire task using the enhancement when possible.

$$\text{Speedup} = \frac{1}{(1 - \text{fraction}_{\text{enhanced}}) + \left(\frac{\text{fraction}_{\text{enhanced}}}{\text{Speedup}_{\text{enhanced}}}\right)}$$

$$2 = \frac{1}{(1 - 0.70) + \frac{0.30}{\text{speedup}_{\text{enhanced}}}}$$

$$2 = \frac{1}{\frac{0.3}{\text{speedup}_{\text{enhanced}}} + 0.3}$$

$$2\left(\frac{0.3}{\text{speedup}_{\text{enhanced}}} + 0.3\right) = 1$$

$$\therefore \text{speedup}_{\text{enhanced}} = \frac{0.6}{0.4} = \boxed{1.5}$$