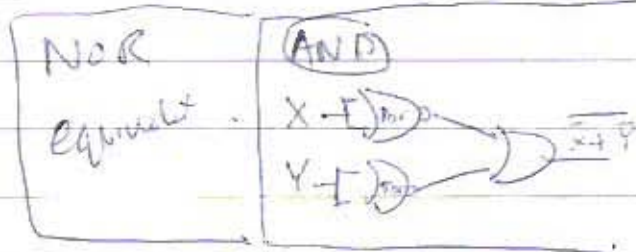
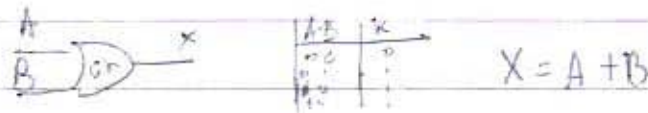
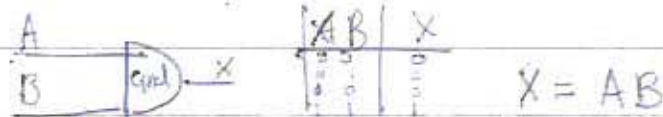


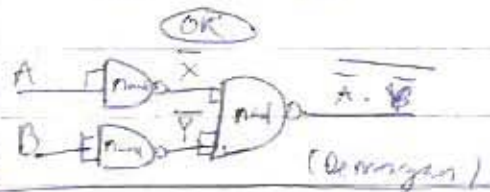
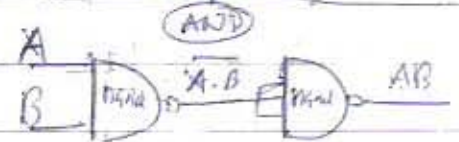
# Diagrams for computing '07

## Logic circuits

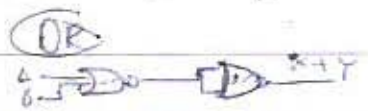
Read  
Chapter  
2.5  
Books



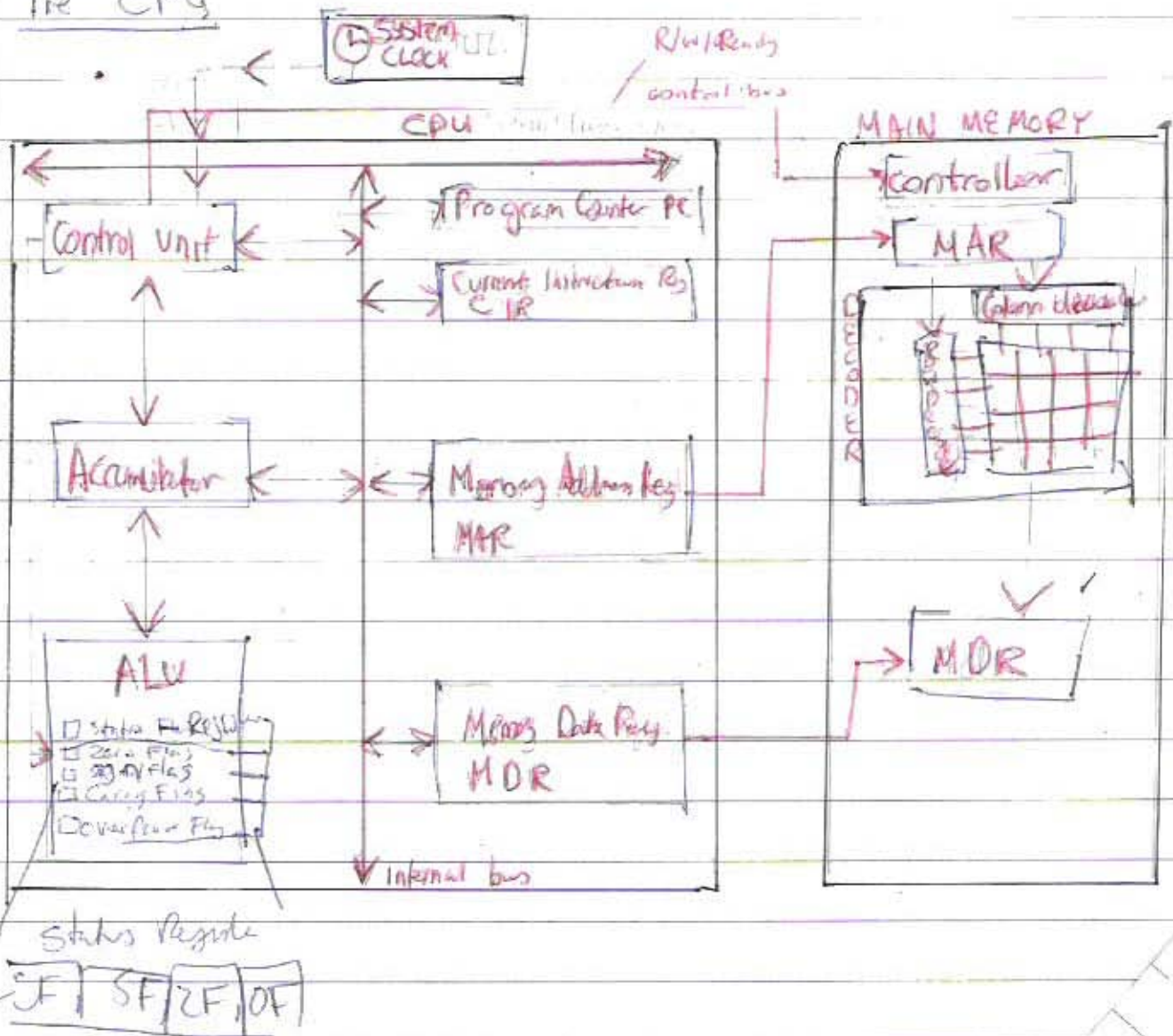
NAND gate equivalent



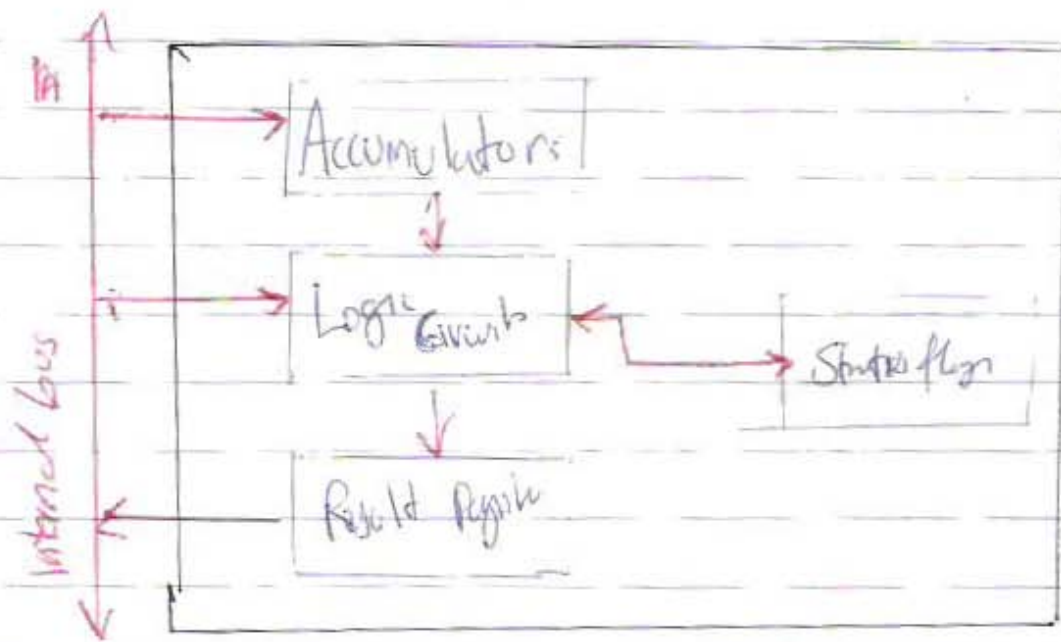
The NOR is equal but AND type = OR type



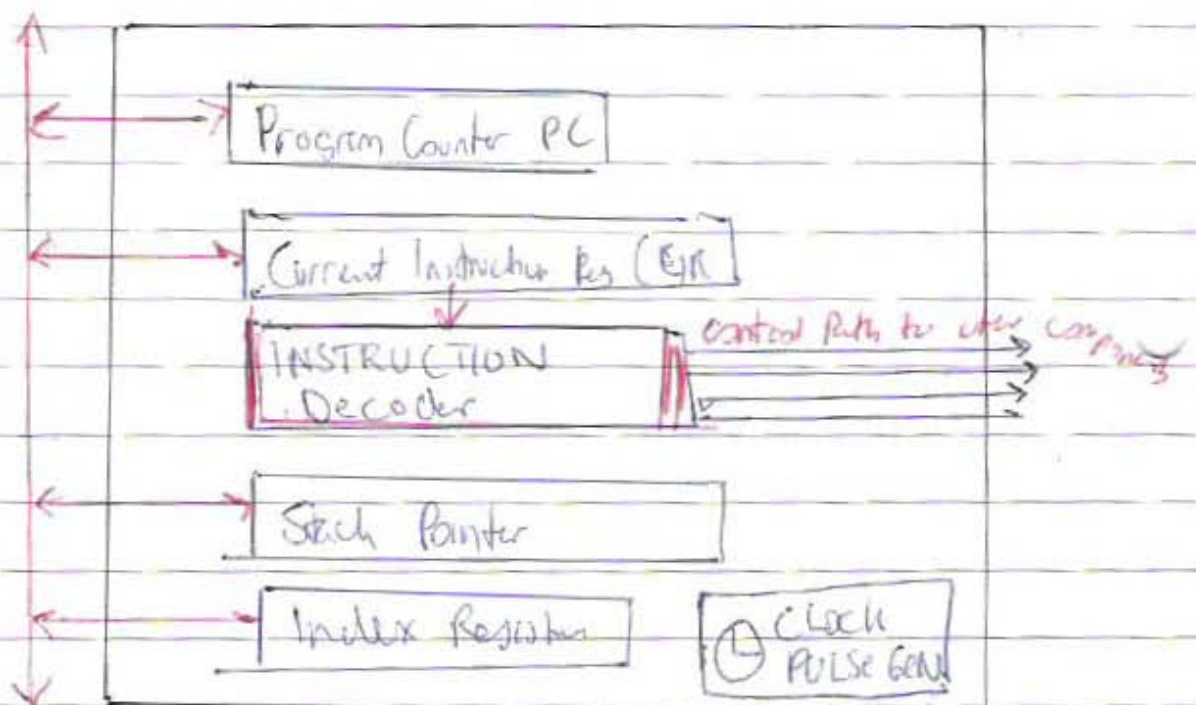
## The CPU



## ALU



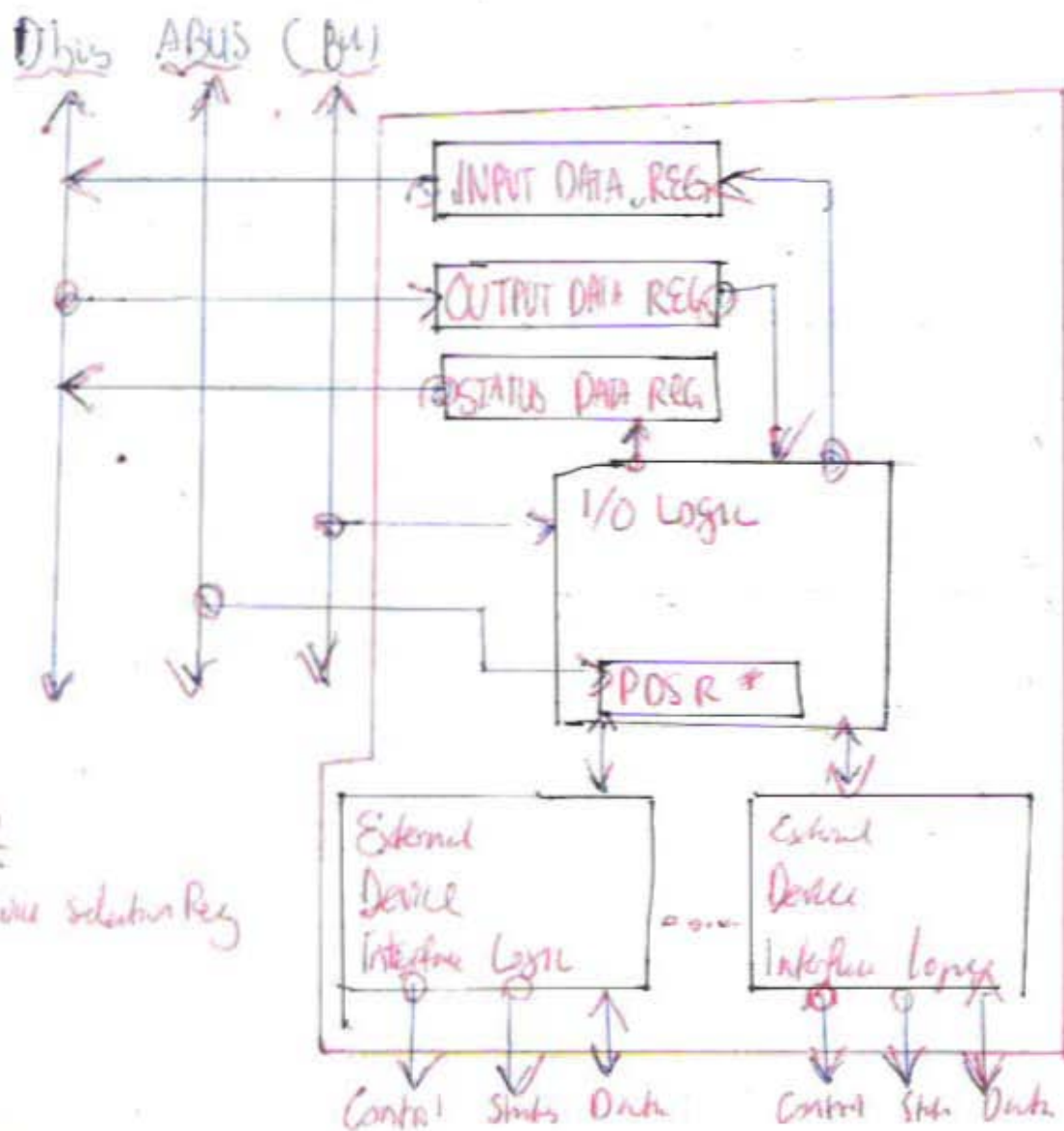
## CU



# I/O Subsystem

## 2 Major Functions

1. Provides standard way of how CPU communicates with any external device
2. Shields CPU from hardware complexity.



\* PDSR  
Peripheral Device Selection Reg

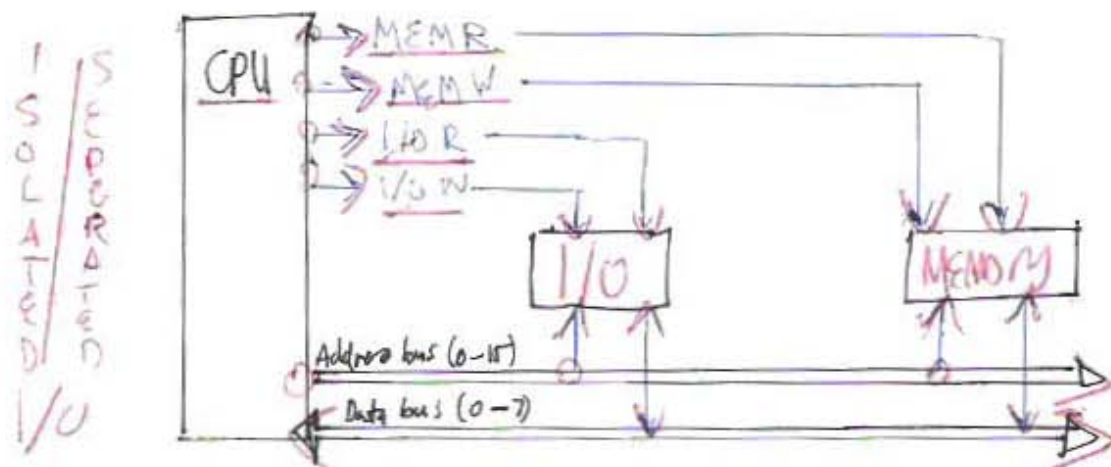
- o The reason external devices don't connect directly to system bus
  1. Since there are a large & different range of devices, it would be impractical to incorporate the receiving logic within CPU, for control a range of devices.
  2. Data transfer rate of external devices is much slower than CPU.
  3. external devices use different data formats - would require them to communicate they are attached to.



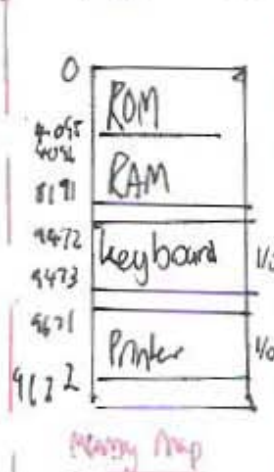
## 2 techniques to identify I/O devices on bus

### Isolated I/O

- keeps I/O devices separate from memory addresses.
- Method • CPU must R/W to particular device
- It places ~~the~~ Device address (say Printer - Device no 3) on address bus, then control lines tell I/O device.
- Whether to place data on the line or to read data.
- If I/O device shares bus lines with memory; control signals must tell whether an address on the bus is for I/O device or memory. (see below)



Memory-Mapped I/O : Used ~~to~~ <sup>location</sup> to assign addresses of I/O devices on memory. (Must not conflict with add. given to mem. loc.)  
 I/O devices are read & written into by using the same control line used for memory. This requires making a map of memory show which locations are devoted to memory & which to I/O devices.



- Memory mapped I/Os have no I/O instructions in their I. set.
- Adv large number of instructions can be used allowing more efficient programming.
- Disadv → Valuable memory <sup>locations</sup> space is used up.

(Next I/O operations)