Section 04.3 - Bit Manipulation

Layer 5: Assembly

Syllabus Content Section 04: Processor Fundamentals

S04.3.1 Show understanding of and perform binary shifts

- logical, arithmetic and cyclic
- Left shift, right shift

`Logical shift`: where bits in the accumulator are shift ed to the right or to the left and a zero moves into the bit position vacated
`Cyclic shift`: similar to a logical shift but bits shift ed from one end reappear at the other end
`Arithmetic shift`: uses the shift to carry out multiplication or division of a signed integer stored in the accumulator
`Left shift`: time 2
`right shift`: divided 2

> Example

- Logic right shift 2 bit
  11111100 -> 00111111
- Arithmetic right shift 2 bit
  11111100 -> 11111111

S04.3.2 Show understanding of how bit manipulation can be used to monitor / control a device

- Carry out bit manipulation operations
- Test and set a bit (using bit masking)

Bit Manipulation is a technique used in a variety of problems to get the solution in an optimized way. This technique is very effective from a Competitive Programming point of view. It is all about Bitwise Operators which directly works upon binary numbers or

bits of numbers that help the implementation fast. Below are the Bitwise Operators that are used:

Bitwise AND (&)
Bitwise OR (|)
Bitwise XOR (^)
Bitwise NOT (!)

Operators	Operations	Result
XOR	X ^ 0s	X
XOR	X ^ 1s	~X
XOR	X ^ X	0
AND	X & 0s	0
AND	X & 1s	X
AND	X & X	X
OR	X | 0s	X
OR	X | 1s	1s
OR	X | X	X