



SNS COLLEGE OF ENGINEERING

Kurumbapalayam (Po), Coimbatore – 641 107

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Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

COURSE NAME : 19EC306 – Digital Circuits

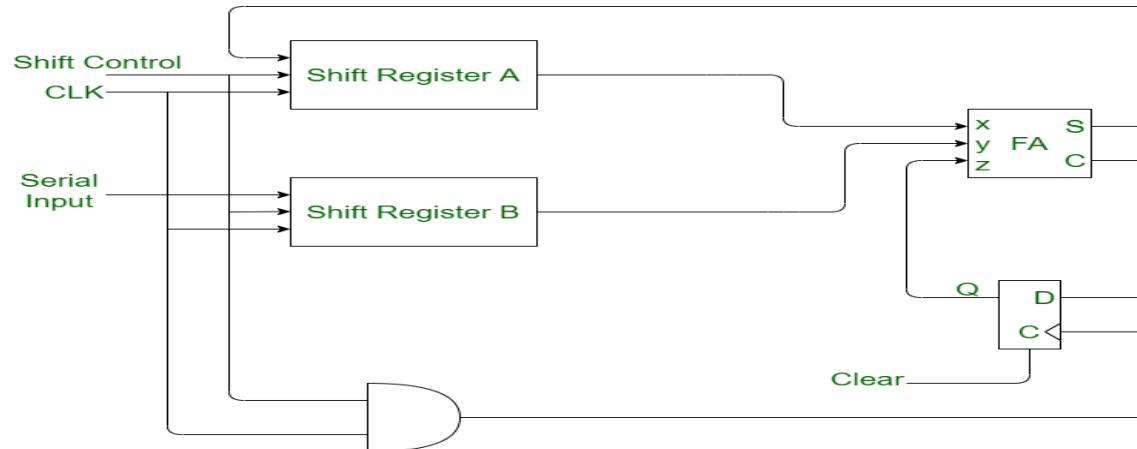
II YEAR / III SEMESTER

Unit I- COMBINATIONAL CIRCUITS
Topic : Serial adder - subtractor, BCD adder

Serial Binary Adder

Serial binary adder is a [combinational logic circuit](#) that performs the addition of two binary numbers in serial form. Serial binary adder performs bit by bit addition. Two shift registers are used to store the binary numbers that are to be added.

A single [full adder](#) is used to add one pair of bits at a time along with the carry. The carry output from the full adder is applied to a [D flip-flop](#). After that output is used as carry for next significant bits. The sum bit from the output of the full adder can be transferred into a third shift register.



Block Diagram of Serial Binary Adder



Working Process:

Following is the procedure of addition using serial binary adder:

•Step-1:

The two shift registers A and B are used to store the numbers to be added.

•Step-2:

A single full adder is used too add one pair of bits at a time along with the carry.

•Step-3:

The contents of the shift registers shift from left to right and their output starting from a and b are fed into a single full adder along with the output of the carry flip-flop upon application of each clock pulse.

•Step-4:

The sum output of the full adder is fed to the most significant bit of the sum register.

•Step-5:

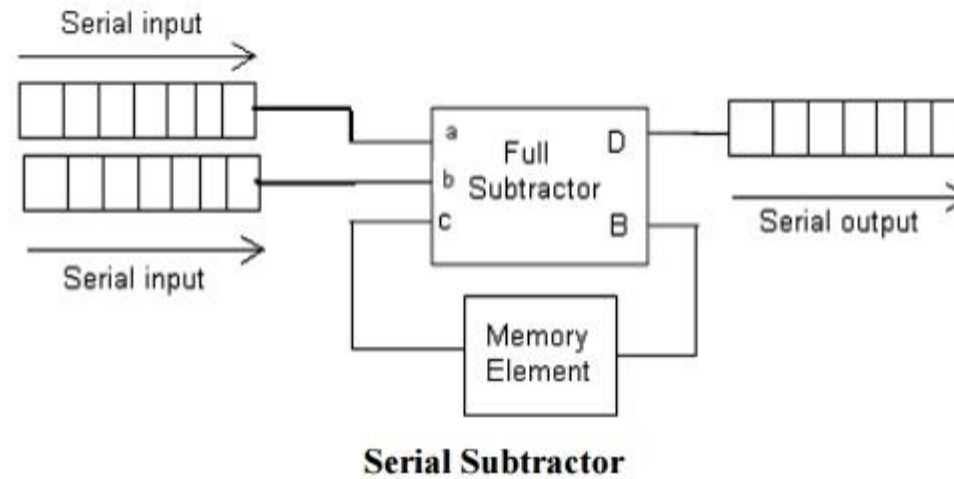
The content of sum register is also shifted to right when clock pulse is applied.

•Step-6:

After applying four clock pulse the addition of two registers (A & B) contents are stored in sum register.

SERIAL SUBTRACTOR

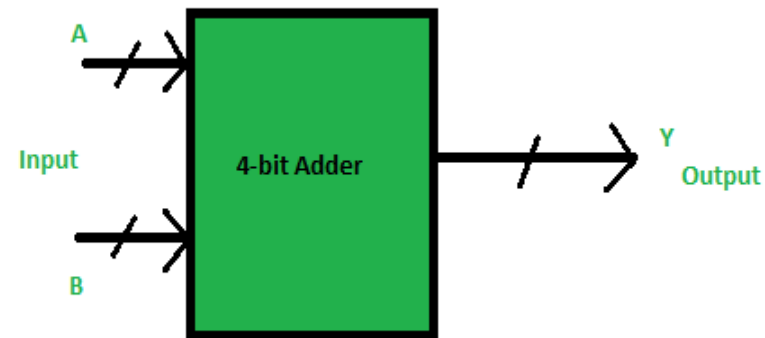
In this circuit, **we have** Input number coming bit by bit and output comes bit by bit and the final borrow at the end:





BCD Adder

BCD stands for binary coded decimal. It is used to perform the addition of BCD numbers. A BCD digit can have any of ten possible four-bit representations. Suppose, we have two 4-bit numbers A and B. The value of A and B can vary from 0(0000 in binary) to 9(1001 in binary) because we are considering decimal numbers.



The output will vary from 0 to 18 if we are not considering the carry from the previous sum. But if we are considering the carry, then the maximum value of output will be 19 (i.e. $9+9+1 = 19$). When we are simply adding A and B, then we get the binary sum. Here, to get the output in BCD form, we will use BCD Adder.

Decimal	Binary Sum					BCD Sum				
	C'	S3'	S2'	S1'	S0'	C	S3	S2	S1	S0
0	0	0	0	0	0	0	0	0	0	0
1	0	0	0	0	1	0	0	0	0	1
2	0	0	0	1	0	0	0	0	1	0
3	0	0	0	1	1	0	0	0	1	1
4	0	0	1	0	0	0	0	1	0	0
5	0	0	1	0	1	0	0	1	0	1
6	0	0	1	1	0	0	0	1	1	0
7	0	0	1	1	1	0	0	1	1	1
8	0	1	0	0	0	0	1	0	0	0
9	0	1	0	0	1	0	1	0	0	1
10	0	1	0	1	0	1	0	0	0	0
11	0	1	0	1	1	1	0	0	0	1
12	0	1	1	0	0	1	0	0	1	0
13	0	1	1	0	1	1	0	0	1	1
14	0	1	1	1	0	1	0	1	0	0
15	0	1	1	1	1	1	0	1	0	1
16	1	0	0	0	0	1	0	1	1	0
17	1	0	0	0	1	1	0	1	1	1
18	1	0	0	1	0	1	1	0	0	0
19	1	0	0	1	1	1	1	0	0	1



Any Query????

Thank you.....