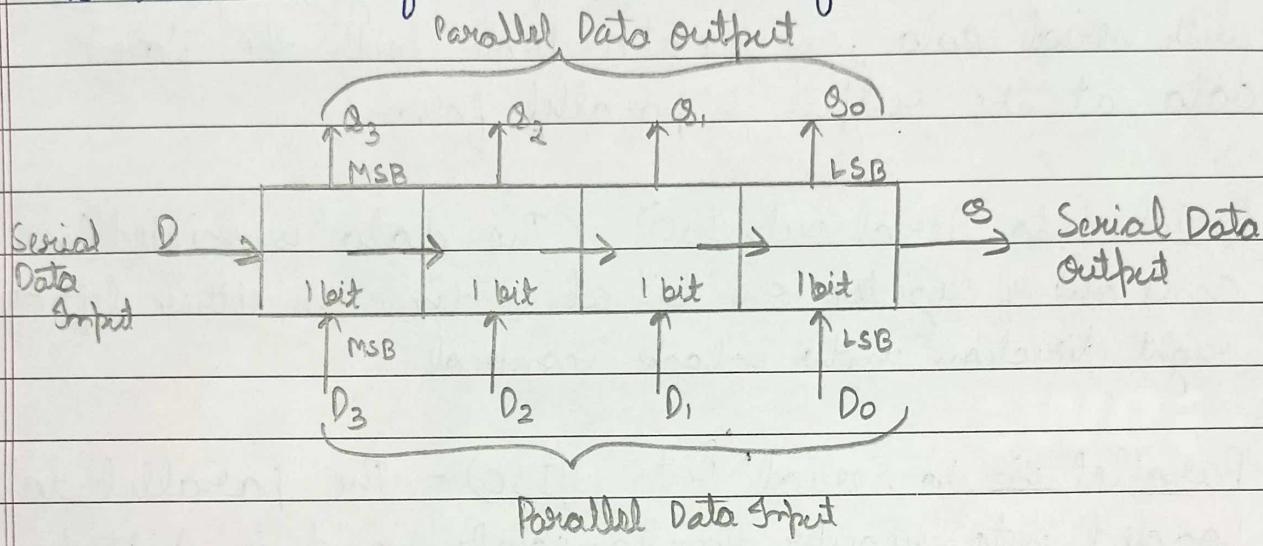


(Q1)

Ans The circuit that would be able to shift bit but also store them for a duration of time is



- This sequential device loads the data present on its input and then moves or "shifts" it to its output once every clock cycle hence the name is Shift Register.
- It consists of several single bit "D-Type Data Latches" one for each bit either a logic "0" or "1" connected together in a serial type arrangement so that output from one data latch becomes the input of the next latch and so on.
- Shift Registers are used for data storage or for the movement of data and are used in calculators also to store data such as two binary numbers.
- Shift register IC's are generally provided with a clear or reset connection so that they can be Set or Reset.

Shift Register operate in one of four different modes

- Serial in to Parallel out (SISO) - The register is loaded with serial data, one bit at a time with the stored data at the output in parallel form.
- Serial in to Serial out (SISO) - The data is shifted in and out of register one bit at a time in either left or right direction under clock control.
- Parallel in to Serial out (PISO) - The parallel data is loaded into register simultaneously and is shifted out of the register serially one bit at a time
- Parallel in to Parallel out (PIPO) - The parallel data is loaded simultaneously into register and transferred together to their respective outputs.

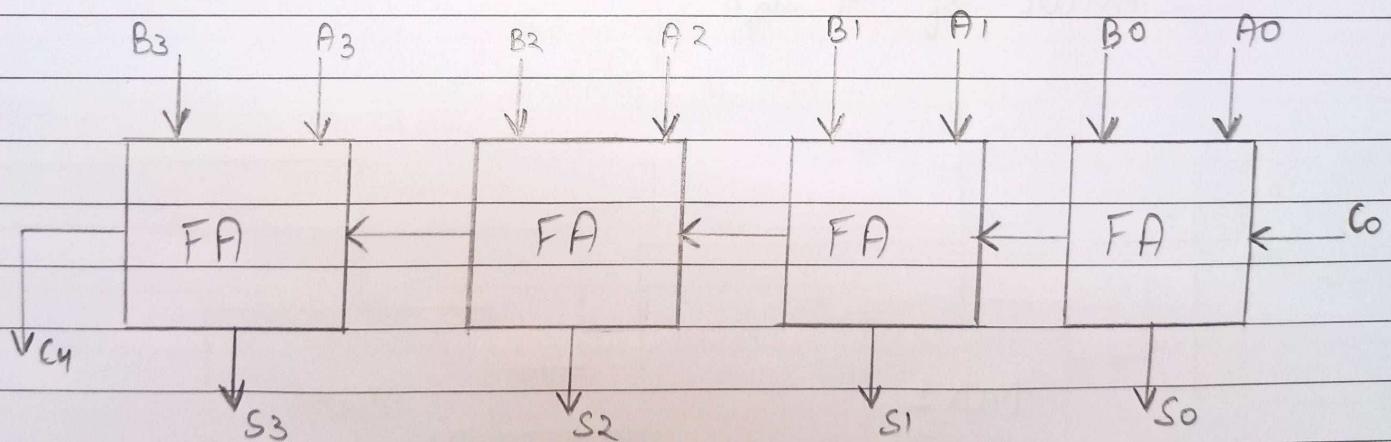
(Q2)

Ans To obtain Equation

$$R_3 \leftarrow R_1 + R_2$$

We can use 4 Bit Binary Adder which can handle 2 bits sum + previous carry also.

- Full Adder = 2 bit sum + previous carry
- Binary Adder = the arithmetic sum of two binary number of any length.
- $C_0$  (input carry)  
 $C_4$  (output carry)



(Q3)

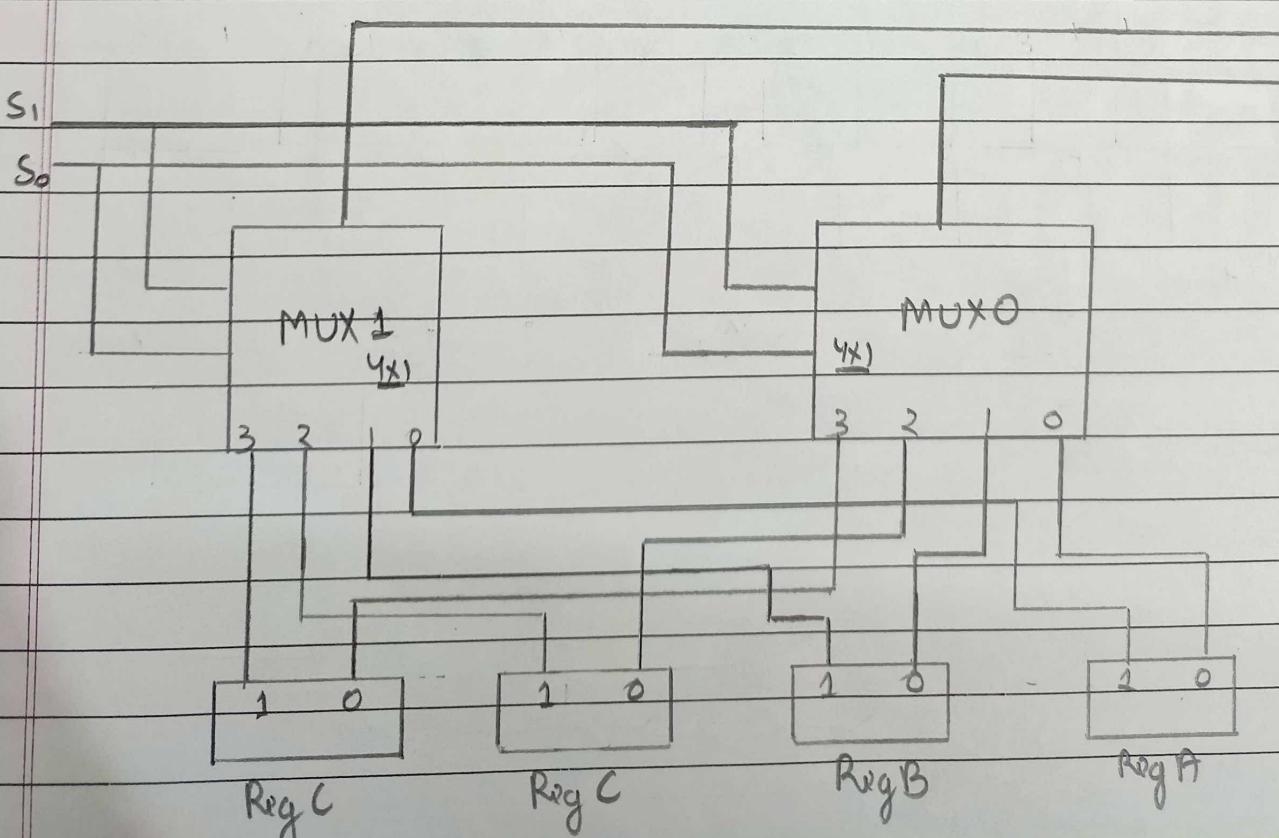
Ans We have used bus structure because it is more efficient for transferring information between register in a multi register configuration system.

A bus consist of a set of common lines, one for each bit of register, through which binary information is transferred.

Control signals determine which register is selected by the bus during a particular register transfer.

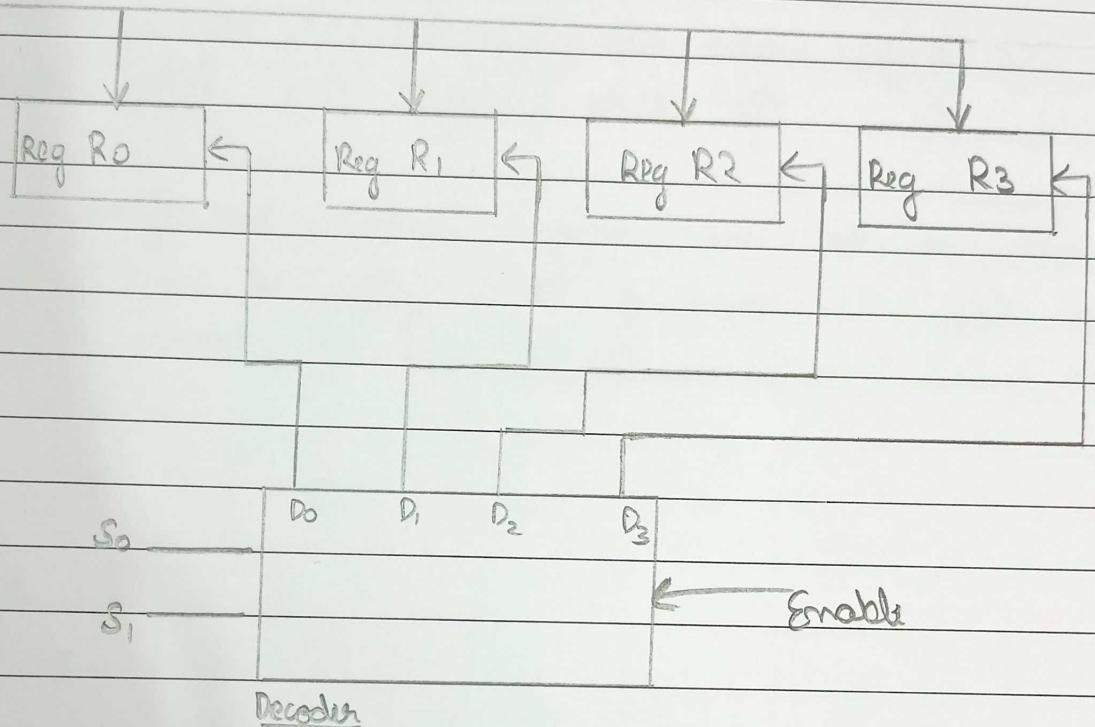
A bus system that can support 4 register of 2 bits.

4 register of 2 bits that means:  
 2 mwc of 4 size



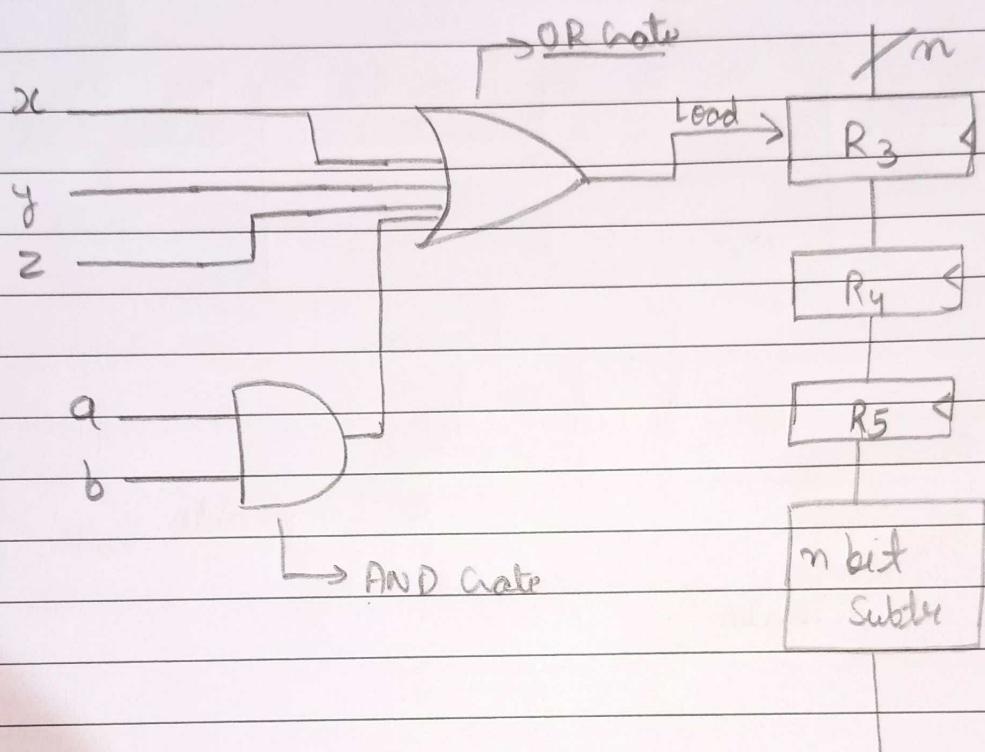
Now to gather data from bus back into register we will use this clk

Bus line

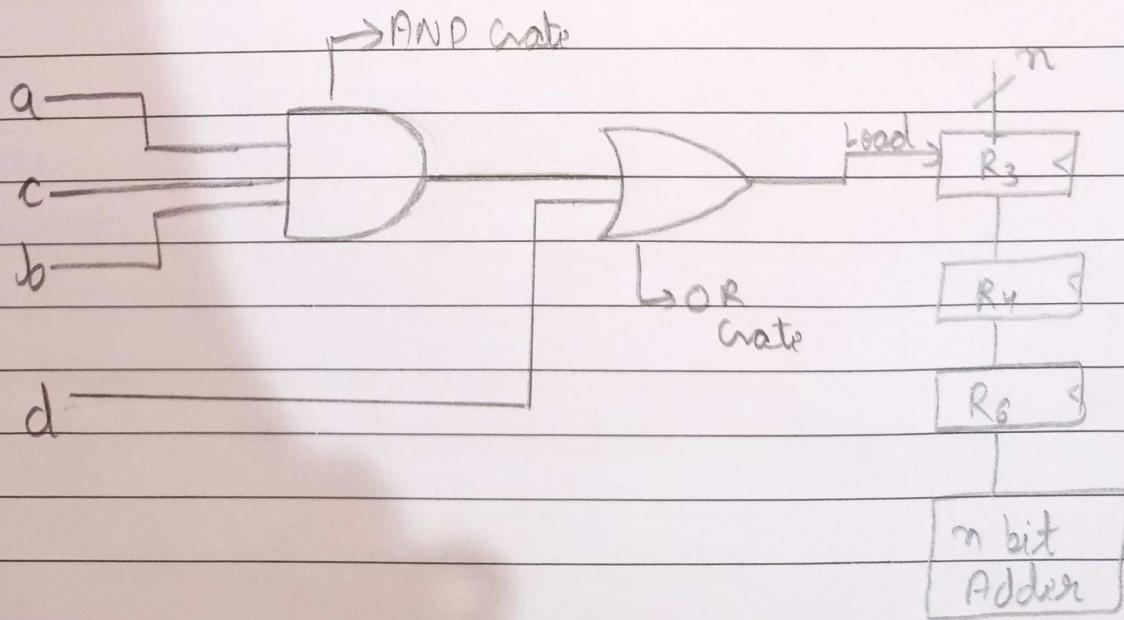


(Q4)

Amb i)  $x + y + z + a \cdot b : R_3 \leftarrow R_4 - R_5$



ii)  $a \cdot c \cdot b + d : R_3 \leftarrow R_4 + R_6$

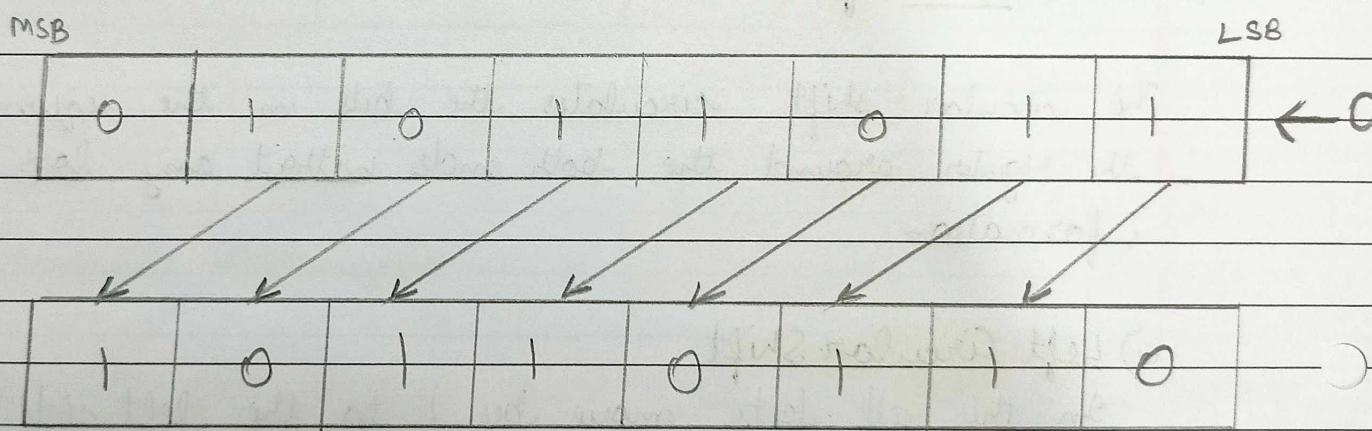


(8.5)

### Sol: Shift-left :

- It transfer the 0 through the serial input. We use symbol shl for logical shift left.
- In this shift one position moves each bit, to the left one by one. The empty least significant bit (LSB) is filled with zero and the (MSB) most significant bit is rejected.

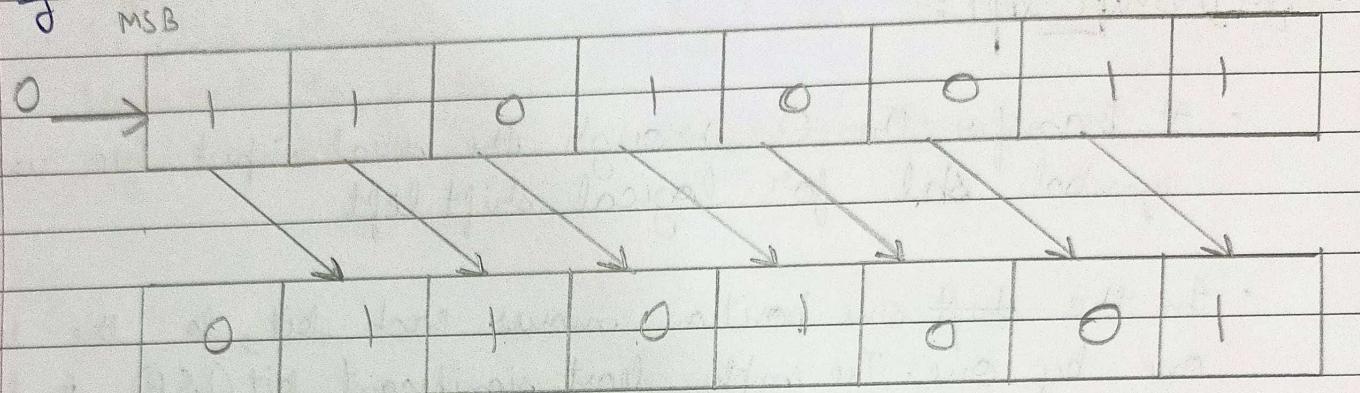
Eg



### ii) Shift-Right

- It transfer the 0 through the serial input. We use symbol shr for logical right.
- In this one position moves each bit, to the right one by one and the least significant bit (LSB) is rejected and the empty MSB is filled with 0.

Eg



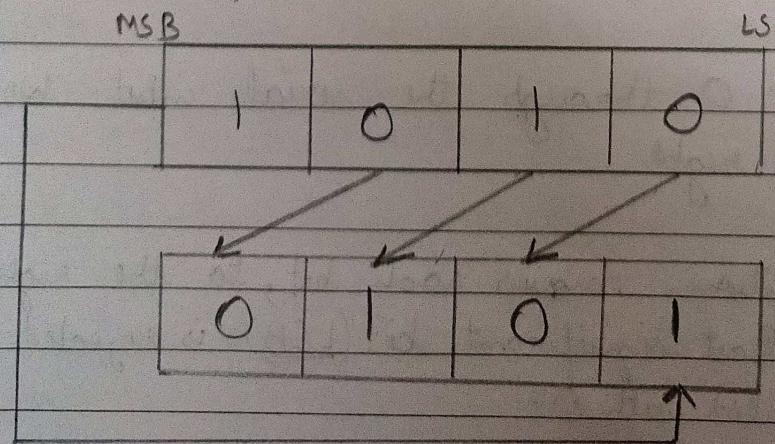
### iii) Circular-Shift

The circular shift circulates the bits in the sequence of the register around the both ends without any loss of information.

#### a) Left Circular Shift

- In this all bits move by 1 to the left side and the MSB will go to LSB
- Left Circular shift is also known as CIL

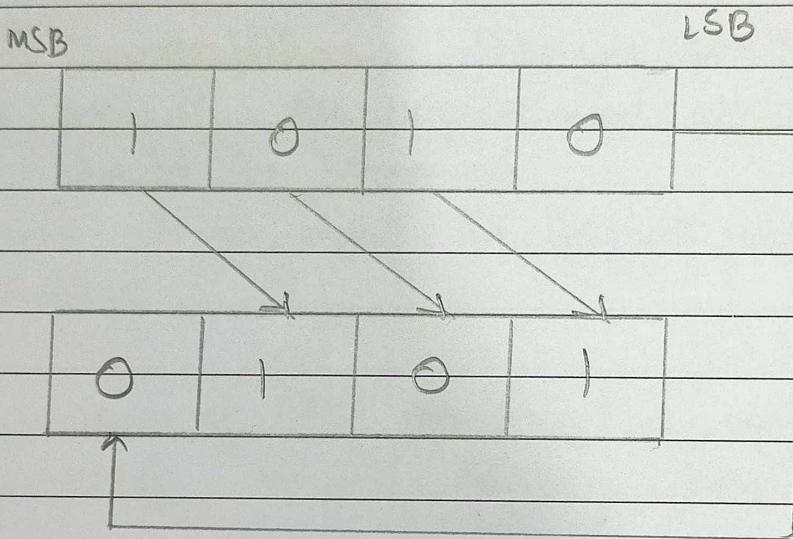
Eg



### b) Right Circular Shift

- In this all bits move by 1 to the right side and LSB will go to MSB
- Right circular shift is also known as ~~Gr~~

Eg



### iv) Computer Organization

Computer organization is concerned with the structure and behaviour of a computer system as seen by the user.

- It tells us how exactly all the units in the system are arranged and interconnected.
- It deals with low level design issues
- It involves physical Components Address, Signals, Peripherals.