EXP - 3



OBJECTIVE:

Study of binary substractors

A. Half substractor
B. Full substractor

THEORY:

SUBTRACTOR

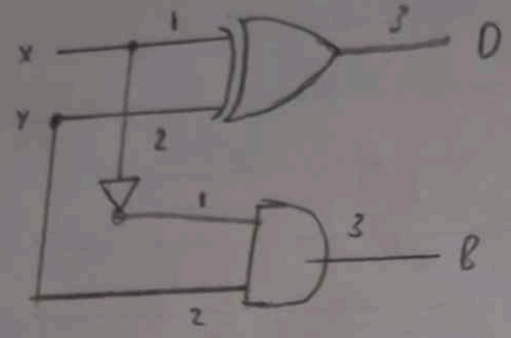
A substractor can be designed using the some approach as that of an adder. The arithemetic operation, substruction of two binary digits has four possible elementary operations namely,

0 - 0 = 0
0 - 1 = 1 with borrow 1
1 - 0 = 0
1 - 1 = 0

in all operations, each subtrahend bit is subracted from minued bit. in case of the second operation the minued bit is smaller than the substracted bit, hence 1 is borrowed.

HALF SUBTRACTOR

A Combinational circuits which performs the subtraction of two bits is called half substractor. This input variables designate the minuend & the subtrahend bit, whereas the output variables produce the difference & borrow bits.




| Input 1 | Input 2 | Diff | Borrow |
|---|---|---|---|
| X | Y | D | B |
| 0 | 0 | 0 | 0 |
| 0 | 1 | 1 | 1 |
| 1 | 0 | 1 | 0 |
| 1 | 1 | 0 | 0 |

FULL SUBTRACTOR

A full-subtractor is a combinational ~~cir~~ circuit that performs a subtraction between two bits, taking into account that a 1 may have been borrowed by a lower significant stage.

A. HALF SUBTRACTOR

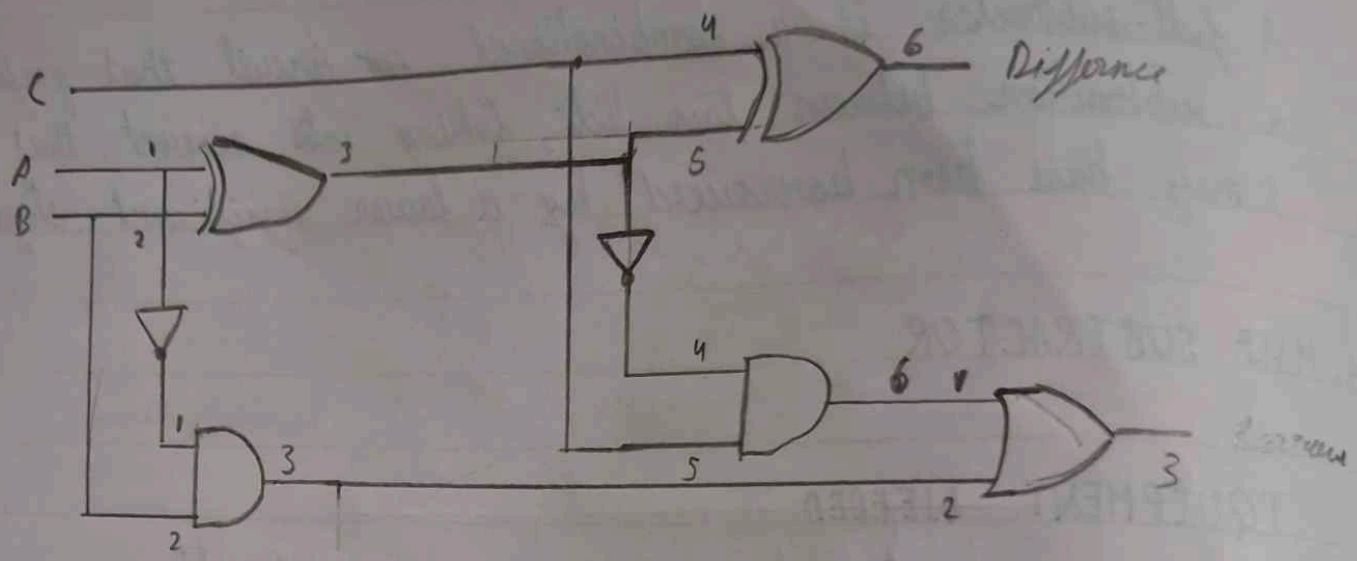
EQUIPMENT NEEDED

| Components | Quantity |
|---|---|
| ① IC 7408 2 input AND gate | 1 |
| ② IC 7486 2 input XOR gate | 1 |
| ③ IC 7404 NOT gate | 1 |

PROCEDURE

When switch is pressed it indicates switch is in "HIGH" position.
When switch is unpressed it indicates switch is in "LOW" position.

① Make connections on bread board as shown in figure.
② Connect +5V to pin no. 14 & GND to pin 7 of IC 7408, IC 7486 & IC 7404,
③ Connect input X & Y to the input switches I0 & I1, respectively
④ Connect difference(D) & Borrow(B) to O0 & O1 of 10 bit led indicator, respectively
⑤ Switch ON the kit.
⑥ Set the input switches S0 & S1 initially to low position.
⑦ Observe outputs D & B on LED L0 & L1 of 10 bit LED indicator, respectively
⑧ Observe the truth table for different input combination




| Input 1 | | | Output 1 | |
|---|---|---|---|---|
| A | B | C | Differe | Borrow |
| 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 1 | 1 | 1 |
| 0 | 1 | 0 | 1 | 1 |
| 0 | 1 | 1 | 0 | 1 |
| 1 | 0 | 0 | 1 | 0 |
| 1 | 0 | 1 | 0 | 0 |
| 1 | 1 | 0 | 0 | 0 |
| 1 | 1 | 1 | 1 | 1 |

⑨ Verify truth table

B. FULL SUBTRACTOR

EQUIPMENT NEEDED

| Component | Quantity |
|---|---|
| ① IC 7408 2 input AND gate | 1 |
| ② IC 7432 2 input OR gate | 1 |
| ③ IC 7486 2 input XOR gate | 1 |
| ④ IC 7404 NOT gate | 1 |

PROCEDURE

① Make connections on bread board as shown in figure.
② Connect +5V to pin no 14 & the GND to pin no 7 of IC 7408, 7432, 7486, 7404
③ Connect inputs A, B, C the input switches
④ Connect Difference (D) & Borrow (B) to D0 & D1 of 10 Bit Led Indicator, respectively.
⑥ Switch ON the kit
⑦ Set the input switches S0, S1 & S2 initially to low position.
⑧ Observe output D & B on LED L0 & L1 of 10 bits LED display, respectively.
⑨ Observe the output for different input combination as shown in truth table.
⑩ Truth Table

OBSERVATION AND RESULT:

Subtractors are studied & truth tables verified

Conclusion :

subtractors studied & truth table verified

**Assessment of the Experiment / Assignment :**

| Timely Submission (07) | Presentation (06) | Understanding (12) | Total (25) | Signature of Teahcer with date |
|---|---|---|---|---|
| 07 | 06 | 11 | 24 | 9/9/24 |