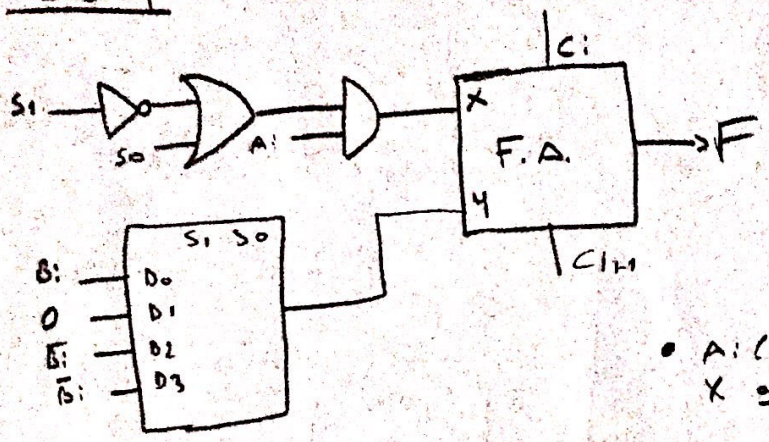
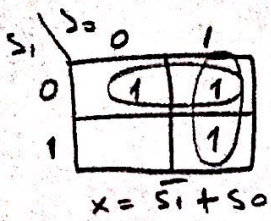
## Soru 4:



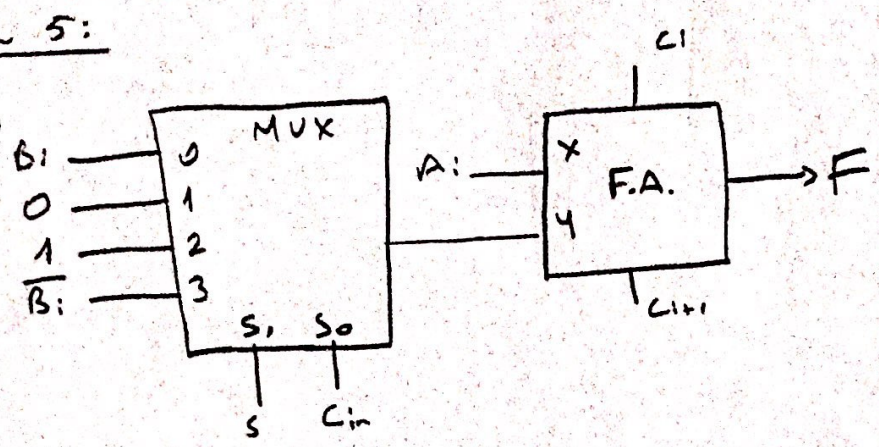




$x = \bar{S_1} + S_0$

- Ai (A bit) ile besleme yaparak X girişine verilir (AND lenerek).

## Soru 5:

5.a)

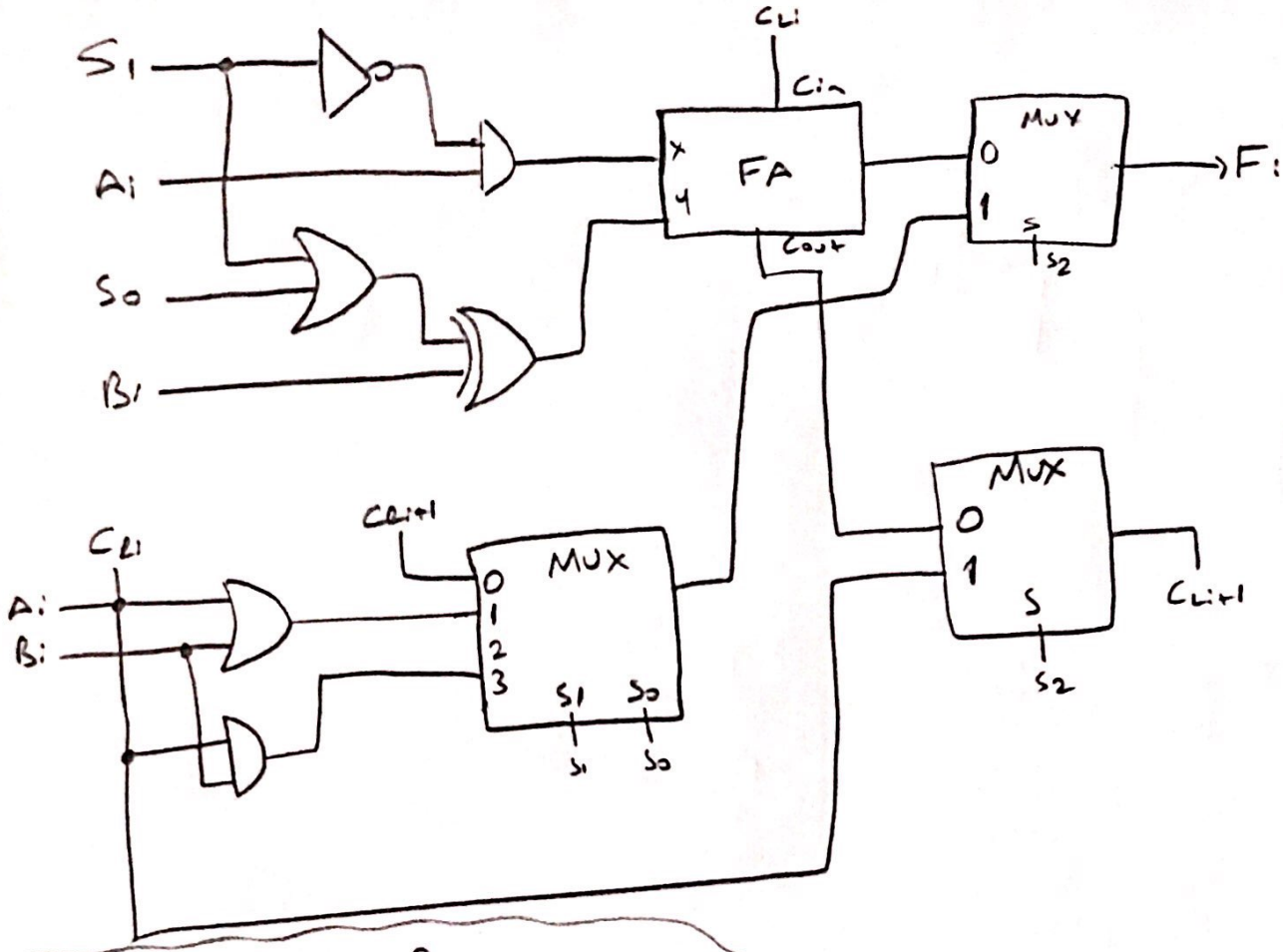



5.b)

| S | Cin | Output Fonksiyon | Operation |
|---|---|---|---|
| 0 | 0 | A+B | Toplama |
| 0 | 1 | A+1 | Arttırma |
| 1 | 0 | A−1 | Azaltma |
| 1 | 1 | A+B̄+1 | Çıkartma |

## Soru 7:

| $S_2$ | $S_1$ | $S_0$ | Operation |
|---|---|---|---|
| 0 | 0 | 0 | A+B |
| 0 | 0 | 1 | A+B̄+1 |
| 0 | 1 | 0 | B̄ |
| 0 | 1 | 1 | B̄+1 |
| 1 | 0 | 0 | SrA |
| 1 | 0 | 1 | A∨B |
| 1 | 1 | 0 | SlA |
| 1 | 1 | 1 | A∧B |




$C_{Li}$ = Carry to left
$C_{Ri}$ = Carry to Right
$C_{Li+1}$ = Carry left to next stage
$C_{Ri+1}$ = Carry right to next stage

## Soru 9:

9.a)

| 15 14 13 | 12 11 10 | 9 8 7 | 6 | 5 4 3 2 | 1 | 0 |
|---|---|---|---|---|---|---|
| R5 | R0 | R0 | Register | F=A⊕B | function | write |
| 1 0 1 | 0 0 0 | 0 0 0 | 0 | 1 0 1 0 | 0 | 1 |

9.b)

| R4 | — | R5 | Register | F=S1B | function | write |
|---|---|---|---|---|---|---|
| 1 0 0 | - - - | 1 0 1 | 0 | 1 1 1 0 | 0 | 1 |

9.c)

| R7 | — | — | — | — | Datain | write |
|---|---|---|---|---|---|---|
| 1 1 1 | - - - | - - - | - | - - - - | 1 | 1 |

9.d)

| R3 | — | R3 | Register | F=srB | function | write |
|---|---|---|---|---|---|---|
| 0 1 1 | - - - | 0 1 1 | 0 | 1 1 0 1 | 0 | 1 |

9.e)

| R1 | R3 | — | constant | F=A+B̄+1 | function | write |
|---|---|---|---|---|---|---|
| 0 0 1 | 0 1 1 | - - - | 1 | 0 1 0 1 | 0 | 1 |

9.f)

| | | | | | | |
|---|---|---|---|---|---|---|
| R1 | R1 | | F=A+1 | function | write |
| 001 | 001 | --- | 0001 | 0 | 1 |

9.g)

| R2 | R1 | R4 | Register | F=A⊕B | function | write |
|---|---|---|---|---|---|---|
| 010 | 001 | 011 | 0 | 1010 | 0 | 1 |

9.h)

| R4 | R3 | R5 | Register | F=A+B | function | write |
|---|---|---|---|---|---|---|
| 100 | 011 | 101 | 0 | 0010 | 0 | 1 |

## Soru 10:

10.a)

| | DA | AA | BA | MB | FS | MD | RW | micro operation |
|---|---|---|---|---|---|---|---|---|
| a | 101 | 100 | 101 | 0 | 1000 | 0 | 1 | R5 ← R4 ∧ R5 |
| b | 110 | 010 | 100 | 0 | 0101 | 0 | 1 | R6 ← R2+R4+1 |
| c | 101 | 110 | 000 | 1 | 1100 | 0 | 1 | R5 ← R0 |
| d | 101 | 000 | 000 | 0 | 0000 | 0 | 1 | R5 ← R0 |
| e | 100 | 100 | 000 | 1 | 1101 | 0 | 1 | R4 ← 3 constant |
| f | 011 | 000 | 000 | 0 | 0000 | 1 | 1 | R3 ← Data in |

10.b)

a = 101 100 101 0 1000 0 1 R5 = 0000 0100

b = 110 010 100 0 0101 0 1 R6 = 1111 1110

c = 101 110 000 1 1100 0 1 R5 = 0000 0000

d = 101 000 000 0 0000 0 1 R5 = 0000 0000

e = 100 100 000 1 1101 0 1 R4 = 0000 0011

f = 011 000 000 0 0000 1 1 R3 = 0001 1011

## Soru 11:

| DA | AA | BA | MB | FS | MD | RW | Micr.Opr. | Result |
|---|---|---|---|---|---|---|---|---|
| 011 | 011 | 001 | 0 | 0010 | 0 | 1 | R3 ← R3+R1 | R3 = 01101111 |
| 100 | 100 | 001 | 0 | 1001 | 0 | 1 | R4 ← R4 ∨ R1 | R4 = 01111100 |
| 101 | 101 | 001 | 0 | 1010 | 0 | 1 | R5 ← R5 ⊕ R1 | R5 = 01101100 |
| 001 | 001 | 000 | 0 | 1011 | 0 | 1 | R1 ← $\overline{R1}$ | R1 = 11011111 |
| 001 | 001 | 000 | 0 | 0001 | 0 | 1 | R1 ← R1+1 | R1 = 11100000 |
| 110 | 110 | 001 | 0 | 0101 | 0 | 1 | R6 ← R6+$\overline{R1}$+1 | R6 = 01100001 |
| 111 | 111 | 001 | 0 | 0101 | 0 | 1 | R7 ← R7+$\overline{R1}$+1 | R7 = 01101001 |
| 001 | 111 | 000 | 0 | 0000 | 0 | 1 | R1 ← R7 | R1 = 01101001 |

DA = Dest. Reg., BA = Source Reg., AA = Source Reg., MB = B register (selamiyorsa 1, seçiliyorsa 0)

Yapilan islemler sonucu;

R1 = 01101001
R2 = 01000100
R3 = 01100111
R4 = 0111 0100
R5 = 01101100
R6 = 01100001
R7 = 01101001

0-255 arasi degerler için tuttuklari degerlerin ASCII karsiliklari;

R1 = i , R2 = D , R3 = g , R4 = t , R5 = l , R6 = a , R7 = i

Digital

## Soru 12:

12.a) $2^6 = 64$

12.b) $2^5 = 32$

12.c) 00000000000000000 - 11111111111111111

12.d) Pozitif: 01111111111111111

Negatif: 11111111111111111

## Soru 13:

13.a) $(130)_{10} = (10000010)_2$

13.b) Ne kadar oldugu için => $\log_2(64) = 6$

Register(6) + Opcode(8) = 14

Bellek = 32 — 32 - 14 = 18 bit for immediate part.

13.c) $2^{18} = 262.144$

13.d) Smallest = 00000000000000000 = 0

Largest = 01111 1111111111111 = 131.071

# Soru 15

| Instruction Register Transfer | DA | AA | BA | MB | FS | MD | RW | MW | PL | SB |
|---|---|---|---|---|---|---|---|---|---|---|
| R[0] ← R[7] ⊕ R[3] | 000 | 111 | 011 | 0 | 1010 | 0 | 1 | 0 | 0 | 0 |
| R[1] ← M[R[4]] | 001 | 100 | - | 0 | 0000 | 1 | 1 | 0 | 0 | 1 |
| R[2] ← R[5]+2 | 011 | 101 | - | 1 | 0010 | 0 | 1 | 0 | 0 | 0 |
| R[3] ← sl R[6] | 011 | 110 | - | 0 | 1110 | 0 | 1 | 0 | 0 | 0 |
| IF(R[4]==0) PC ← PC+2 PC else PC ← PC+1 | - | 010 | - | 1 | 0000 | 0 | 0 | 0 | 1 | 0 |

| Instruction Register Transfer | Opcode | DR | SA | SB or Operand |
|---|---|---|---|---|
| R[0] ← sr R[7] | 0001101 | 000 | 111 | 0 |
| R[1] ← M[R[6]] | 0010000 | 001 | 110 | 0 |
| R[2] ← R[5]+4 | 1000010 | 010 | 101 | 4 |
| R[3] ← R[4] ⊕ R[3] | 0001010 | 011 | 100 | 011 |
| R[4] ← R[2] - R[2] | 0001101 | 100 | 010 | 001 |

Onur KOCKLAN
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