

## CSE331 Computer Organization HW3 Report

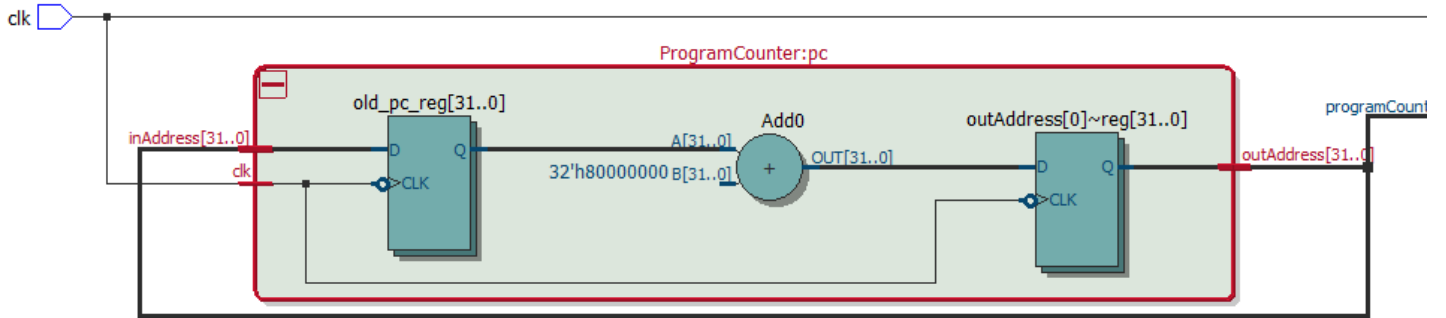
Muhammed ÖZKAN 151044084

Ödevin yapımında hazırlanan DataPath çizimi pdf dosyası olarak proje klasörüne eklenmiştir.

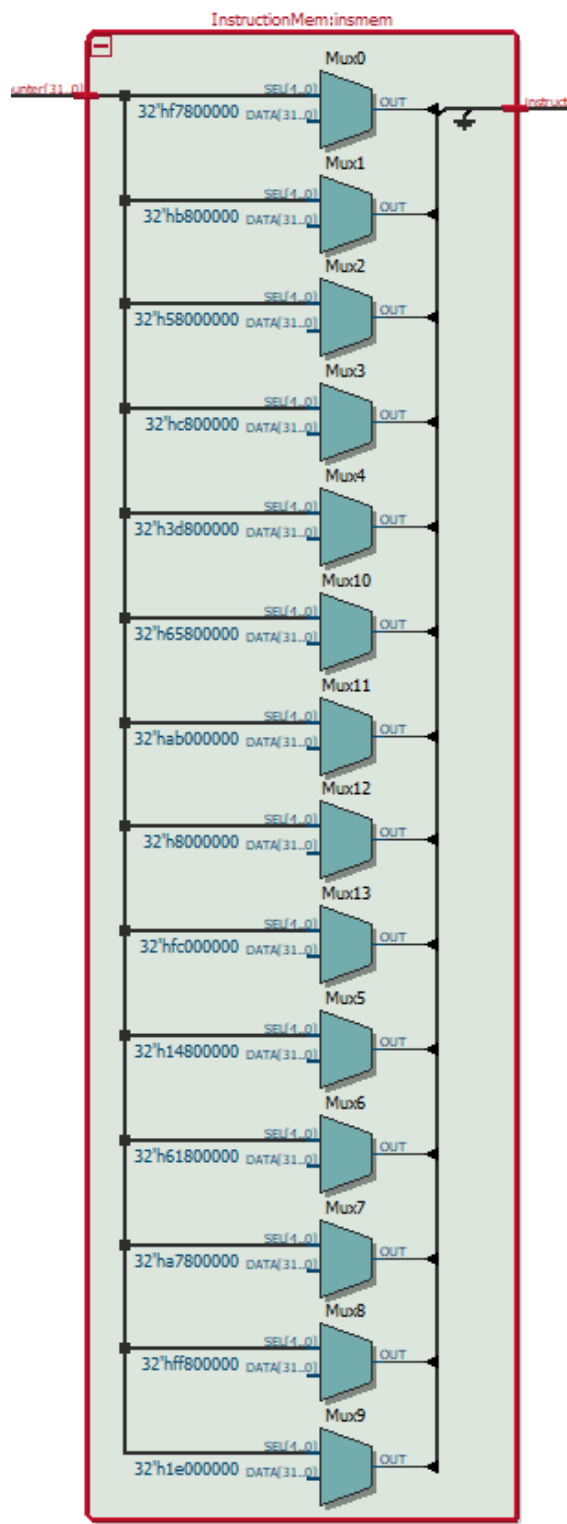
Proje “MipsSingleCycle\_testbench” ile test edilebilir. 500ns sonra program duracak şekilde ayarlanmıştır. Program sonunda çıkmak istediğini onaylamanız gereken bir evet hayır penceresi çıkacaktır. Bu pencerede hayır diyerek konsol ekranındaki sonuçları inceleyebilirsiniz.

Tasarımda kullanılan bazı yapılar önceki ödevden alınmıştır. İçeriklerine önceki ödev raporundan ulaşılabilir.

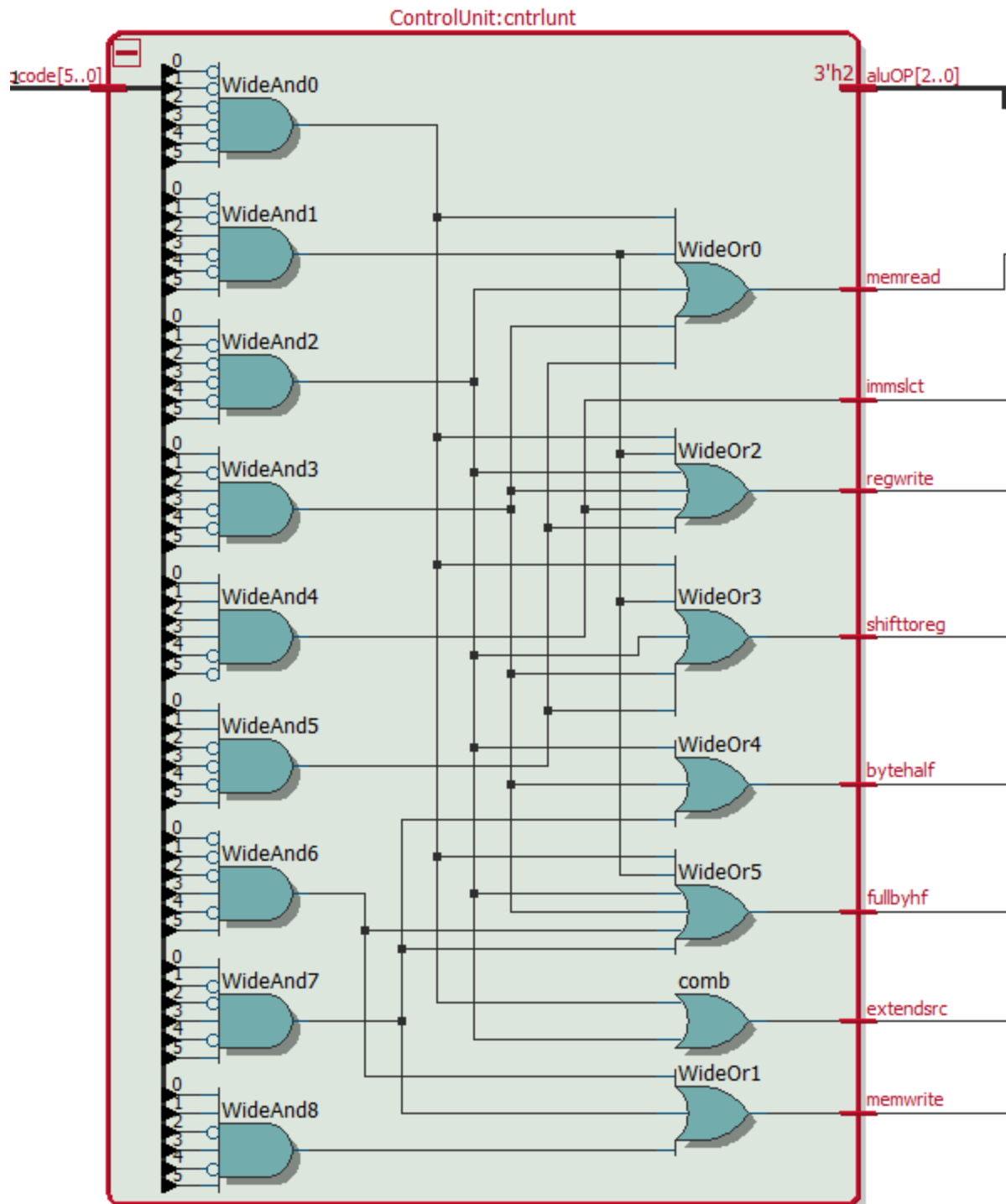
### ProgramCounter



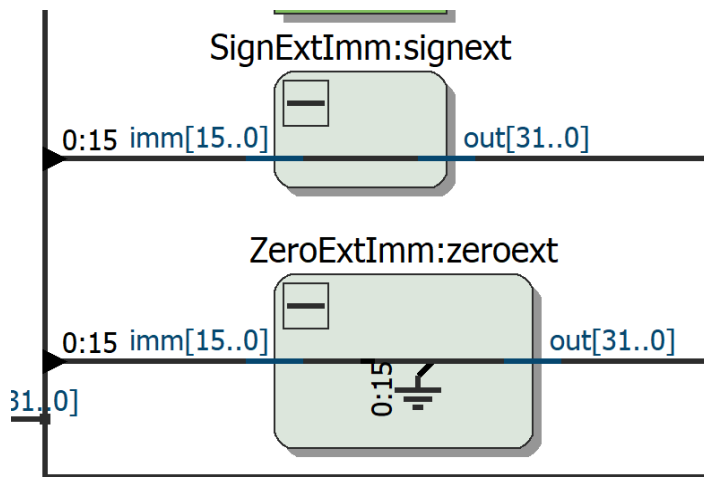
## InstructionMem



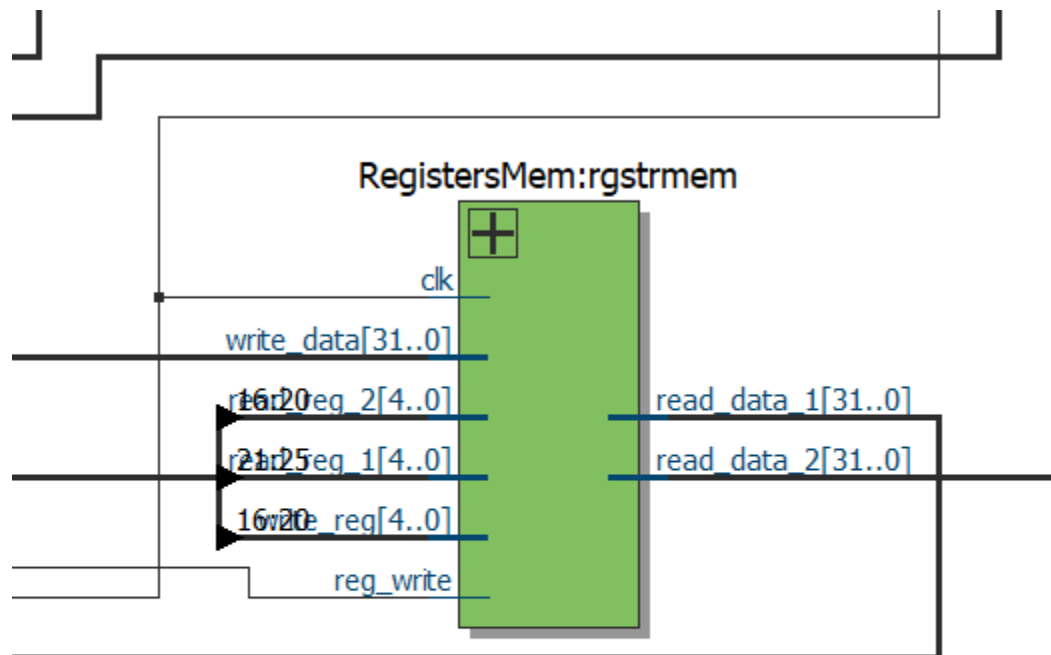
## ControlUnit



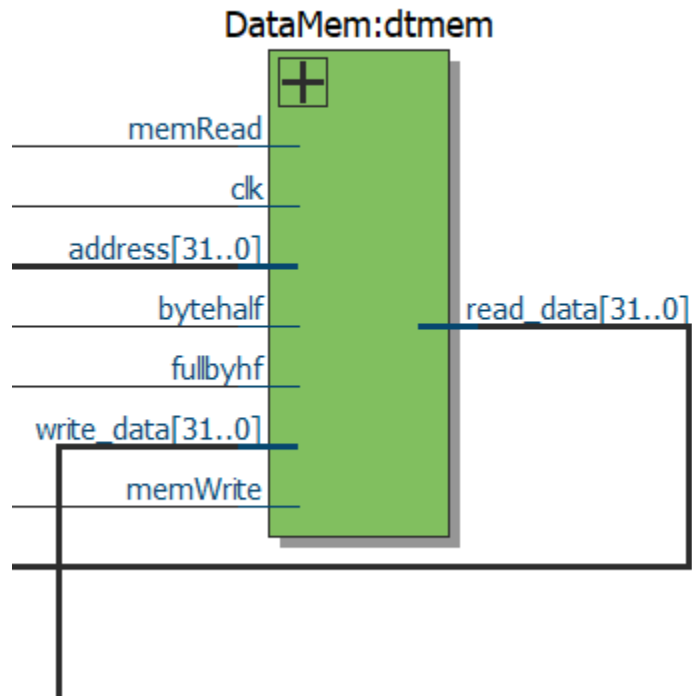
## Sign Extend – Zero Extend



## RegisterMem



## DataMem



## Control Unit Table

	OP	memread	memwrite	regwrite	shiftoereg	extendsrc	bytehalf	full/byhf	immslct
load byte	20	1	0	1	1	1	0	1	0
load byte Unsigned	24	1	0	1	1	0	0	1	0
load Halfword	21	1	0	1	1	1	1	1	0
load Halfword Unsigned	25	1	0	1	1	0	1	1	0
load upper imm	f	0	0	1	x	x	x	x	1
load word	23	1	0	1	1	0	x	0	0
store byte	28	0	1	0	x	0	0	1	0
store half word	29	0	1	0	x	0	1	1	0
store word	2b	0	1	0	x	0	x	0	0

## 10000000010100100000000000000001

```
PC= 0 opcode=100000 rs=00001 rt=01001 imm=0000000000000001
aluOP=010 memread=1 memwrite=0 regwrite=1 shifttoreg=1 extendsrc=1 bytehalf=0 fullbyhf=1,immslct=0
read_data1=00000000000000000000000000000001, read_data2=00000000000000000000000000000000
extendimm=00000000000000000000000000000001, signimm=00000000000000000000000000000001, zeroimm=00000000000000000000000000000001
alurestult=00000000000000000000000000000010, extendimm=00000000000000000000000000000001, aluOP=010
read_data_mem=000100011000010000000001100010000
shiftregresult=00010001100001000000001100010000, bytehalfresult=00000000000000000000000000010000
write_data=0000000000000000000000000000010000, fullbyteresult=0000000000000000000000000000010000
```

## 100100000100101000000000000000001

```
PC= 1 opcode=100100 rs=00010 rt=01010 imm=0000000000000001
aluOP=010 memread=1 memwrite=0 regwrite=1 shifttoreg=1 extendsrc=0 bytehalf=0 fullbyhf=1,immslct=0
read_data1=00000000000000000000000000000010, read_data2=00000000000000000000000000000000
extendimm=00000000000000000000000000000001, signimm=00000000000000000000000000000001, zeroimm=00000000000000000000000000000001
alurestult=000000000000000000000000000000011, extendimm=00000000000000000000000000000001, aluOP=010
read_data_mem=00000100000110000011100000000011
shiftregresult=00000100000110000011100000000011, bytehalfresult=00000000000000000000000000000011
write_data=000000000000000000000000000000011, fullbyteresult=000000000000000000000000000000011
```

## 100001000110101100000000000000001

```
PC= 2 opcode=100001 rs=00011 rt=01011 imm=0000000000000001
aluOP=010 memread=1 memwrite=0 regwrite=1 shifttoreg=1 extendsrc=1 bytehalf=1 fullbyhf=1,immslct=0
read_data1=000000000000000000000000000000011, read_data2=00000000000000000000000000000000
extendimm=00000000000000000000000000000001, signimm=00000000000000000000000000000001, zeroimm=00000000000000000000000000000001
alurestult=0000000000000000000000000000000100, extendimm=00000000000000000000000000000001, aluOP=010
read_data_mem=011100011000010000011111100000110
shiftregresult=011100011000010000011111100000110, bytehalfresult=000000000000000000011111100000110
write_data=000000000000000000011111100000110, fullbyteresult=000000000000000000011111100000110
```

## 100101001000110000000000000000001

```
PC= 3 opcode=100101 rs=00100 rt=01100 imm=0000000000000001
aluOP=010 memread=1 memwrite=0 regwrite=1 shifttoreg=1 extendsrc=0 bytehalf=1 fullbyhf=1,immslct=0
read_data1=000000000000000000000000000000100, read_data2=00000000000000000000000000000000
extendimm=00000000000000000000000000000001, signimm=00000000000000000000000000000001, zeroimm=00000000000000000000000000000001
alurestult=0000000000000000000000000000000101, extendimm=00000000000000000000000000000001, aluOP=010
read_data_mem=00001110000000111000001101100000
shiftregresult=00001110000000111000001101100000, bytehalfresult=00000000000000000001000001101100000
write_data=00000000000000000001000001101100000, fullbyteresult=00000000000000000001000001101100000
```

## 001111000000110100011100000000101

```
PC= 4 opcode=001111 rs=00000 rt=01101 imm=0001110000000101
aluOP=010 memread=0 memwrite=0 regwrite=1 shifttoreg=0 extendsrc=0 bytehalf=0 fullbyhf=0,immslct=1
read_data1=000000000000000000000000000000000, read_data2=00000000000000000000000000000000
extendimm=00000000000000000001110000000101, signimm=00000000000000000001110000000101, zeroimm=00000000000000000001110000000101
alurestult=00000000000000000001110000000101, extendimm=00000000000000000001110000000101, aluOP=010
read_data_mem=XXXXXXXXXXXXXXXXXXXXXXXXXXXX
shiftregresult=00000000000000000001110000000101, bytehalfresult=00000000000000000000000000000101
write_data=00011100000001010000000000000000, fullbyteresult=00000000000000000001110000000101
```

## 100011001010111000000000000000001

```
PC= 5 opcode=100011 rs=00101 rt=01110 imm=0000000000000001
aluOP=010 memread=1 memwrite=0 regwrite=1 shifttoreg=1 extendsrc=0 bytehalf=0 fullbyhf=0,immslct=0
read_data1=0000000000000000000000000000000101, read_data2=00000000000000000000000000000000
extendimm=00000000000000000000000000000001, signimm=00000000000000000000000000000001, zeroimm=00000000000000000000000000000001
alurestult=0000000000000000000000000000000110, extendimm=00000000000000000000000000000001, aluOP=010
read_data_mem=00011100010011000100001111000100
shiftregresult=00011100010011000100001111000100, bytehalfresult=00000000000000000000000000000100
write_data=00011100010011000100001111000100, fullbyteresult=00011100010011000100001111000100
```

## 1010000000101101000000000000000100

```
PC= 6 opcode=101000 rs=00001 rt=01101 imm=00000000000000100
aluOP=010 memread=0 memwrite=0 regwrite=0 shifttoreg=0 extendsrc=0 bytehalf=0 fullbyhf=1,immslct=0
read_data1=000000000000000000000000000000001, read_data2=00011100000001010000000000000000
extendimm=0000000000000000000000000000000100, signimm=0000000000000000000000000000000100, zeroimm=0000000000000000000000000000000100
alurestult=0000000000000000000000000000000101, extendimm=0000000000000000000000000000000100, aluOP=010
read_data_mem=XXXXXXXXXXXXXXXXXXXXXXXXXXXX
shiftregresult=0000000000000000000000000000000101, bytehalfresult=00000000000000000000000000000101
write_data=0000000000000000000000000000000101, fullbyteresult=00000000000000000000000000000101
```

## 10100100011010110000000000000100

```
PC= 7 opcode=101001 rs=00011 rt=01011 imm=0000000000000100
aluOP=010 memread=0 memwrite=1 regwrite=0 shifttoreg=0 extendsrc=0 bytehalf=1 fullbyhf=1,immslct=0
read_data1=00000000000000000000000000000000011, read_data2=0000000000000000000001111100000110
extendimm=0000000000000000000000000000000100, signimm=00000000000000000000000000000100, zeroimm=00000000000000000000000000000100
aluresult=0000000000000000000000000000000111, extendimm=00000000000000000000000000000100, aluOP=010
read_data_mem=xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
shiftregresult=0000000000000000000000000000000111, bytehalfresult=00000000000000000000000000000111
write_data=0000000000000000000000000000000111, fullbyteresult=00000000000000000000000000000111
```

## 10101100111010100000000000000100

```
PC= 8 opcode=101011 rs=00111 rt=01010 imm=0000000000000100
aluOP=010 memread=0 memwrite=1 regwrite=0 shifttoreg=0 extendsrc=0 bytehalf=0 fullbyhf=0,immslct=0
read_data1=0000000000000000000000000000000000, read_data2=000000000000000000000000000000011
extendimm=0000000000000000000000000000000100, signimm=00000000000000000000000000000100, zeroimm=00000000000000000000000000000100
aluresult=000000000000000000000000000000000100, extendimm=00000000000000000000000000000100, aluOP=010
read_data_mem=xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
shiftregresult=0000000000000000000000000000000100, bytehalfresult=00000000000000000000000000000100
write_data=0000000000000000000000000000000100, fullbyteresult=00000000000000000000000000000100
```

## 100000000011100100000000000010001

```
PC= 9 opcode=100000 rs=00001 rt=11001 imm=00000000000010001
aluOP=010 memread=1 memwrite=0 regwrite=1 shifttoreg=1 extendsrc=1 bytehalf=0 fullbyhf=1,immslct=0
read_data1=0000000000000000000000000000000000, read_data2=0000000000000000000000000000000000
extendimm=000000000000000000000000000000010001, signimm=0000000000000000000000000000010001, zeroimm=0000000000000000000000000000010001
aluresult=000000000000000000000000000000010010, extendimm=0000000000000000000000000000010001, aluOP=010
read_data_mem=000001000001100000111000000000011
shiftregresult=00000100000110000011100000000011, bytehalfresult=0000000000000000000000000000011
write_data=000000000000000000000000000000011, fullbyteresult=0000000000000000000000000000011
```

## 100100000101101000000000000010001

```
PC=10 opcode=100100 rs=00010 rt=11010 imm=00000000000010001
aluOP=010 memread=1 memwrite=0 regwrite=1 shifttoreg=1 extendsrc=0 bytehalf=0 fullbyhf=1,immslct=0
read_data1=000000000000000000000000000000010, read_data2=000000000000000000000000010010110
extendimm=000000000000000000000000000000010001, signimm=0000000000000000000000000000010001, zeroimm=0000000000000000000000000000010001
aluresult=00000000000000000000000000000000010011, extendimm=0000000000000000000000000000010001, aluOP=010
read_data_mem=01110001100110100001111110010110
shiftregresult=01110001100110100001111110010110, bytehalfresult=0000000000000000000000000000010110
write_data=000000000000000000000000000000010010110, fullbyteresult=0000000000000000000000000000010010110
```

## 100001000111101100000000000010001

```
,
PC=11 opcode=100001 rs=00011 rt=11011 imm=00000000000010001
aluOP=010 memread=1 memwrite=0 regwrite=1 shifttoreg=1 extendsrc=1 bytehalf=1 fullbyhf=1,immslct=0
read_data1=00000000000000000000000000000000011, read_data2=0000000000000000000000000000000000
extendimm=000000000000000000000000000000010001, signimm=0000000000000000000000000000010001, zeroimm=0000000000000000000000000000010001
aluresult=0000000000000000000000000000000001000, extendimm=0000000000000000000000000000010001, aluOP=010
read_data_mem=00001110000000111000001101100000
shiftregresult=00001110000000111000001101100000, bytehalfresult=000000000000000001000001101100000
write_data=000000000000000001000001101100000, fullbyteresult=000000000000000001000001101100000
```

## 1001010010011110000000000000010001

```
PC=12 opcode=100101 rs=00100 rt=11100 imm=00000000000010001
aluOP=010 memread=1 memwrite=0 regwrite=1 shifttoreg=1 extendsrc=0 bytehalf=1 fullbyhf=1,immslct=0
read_data1=0000000000000000000000000000000100, read_data2=0000000000000000000000000000000000
extendimm=000000000000000000000000000000010001, signimm=0000000000000000000000000000010001, zeroimm=0000000000000000000000000000010001
aluresult=00000000000000000000000000000000010101, extendimm=0000000000000000000000000000010001, aluOP=010
read_data_mem=00011101010011000100001111010100
shiftregresult=00011101010011000100001111010100, bytehalfresult=00000000000000000100001111010100
write_data=0000000000000000000100001111010100, fullbyteresult=0000000000000000000100001111010100
```

## 00111100000111011001110101001101

```
,
PC=13 opcode=001111 rs=00000 rt=11101 imm=1001110101001101
aluOP=010 memread=0 memwrite=0 regwrite=1 shifttoreg=0 extendsrc=0 bytehalf=0 fullbyhf=0,immslct=1
read_data1=0000000000000000000000000000000000, read_data2=0000000000000000000000000000000000
extendimm=1111111111111100110101001101, signimm=1111111111111100110101001101, zeroimm=000000000000000001001110101001101
aluresult=1111111111111100110101001101, extendimm=1111111111111100110101001101, aluOP=010
read_data_mem=xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
shiftregresult=1111111111111100110101001101, bytehalfresult=000000000000000000000000000001001101
write_data=10011101010011010000000000000000, fullbyteresult=1111111111111100110101001101
```

## 1000110010111110000000000010001

```
PC=14 opcode=100011 rs=00101 rt=11110 imm=0000000000010001
aluOP=010 memread=1 memwrite=0 regwrite=1 shifttoreg=1 extendsrc=0 bytehalf=0 fullbyhf=0,immslct=0
read_data1=00000000000000000000000000000001, read_data2=00000000000000000000000000000000
extendimm=000000000000000000000000000010001, signimm=000000000000000000000000000010001, zeroimm=000000000000000000000000000010001
alurest=0000000000000000000000000000010110, extendimm=000000000000000000000000000010001, aluOP=010
read_data_mem=00001100001100000111100010000010
shiftregresult=00001100001100000111100010000010, bytehalfresult=000000000000000000000000000010000010
write_data=00001100001100000111100010000010, fullbyteresult=00001100001100000111100010000010
```

## 10100000001111010000000000010100

```
PC=15 opcode=101000 rs=00001 rt=11101 imm=0000000000010100
aluOP=010 memread=0 memwrite=1 regwrite=0 shifttoreg=0 extendsrc=0 bytehalf=0 fullbyhf=1,immslct=0
read_data1=000000000000000000000000000000001, read_data2=10011010100110100000000000000000
extendimm=0000000000000000000000000000010100, signimm=000000000000000000000000000010100, zeroimm=000000000000000000000000000010100
alurest=0000000000000000000000000000010101, extendimm=000000000000000000000000000010100, aluOP=010
read_data_mem=xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
shiftregresult=0000000000000000000000000000010101, bytehalfresult=000000000000000000000000000010101
write_data=0000000000000000000000000000010101, fullbyteresult=000000000000000000000000000010101
```

## 10100100011110110000000000010100

```
PC=16 opcode=101001 rs=00011 rt=11011 imm=0000000000010100
aluOP=010 memread=0 memwrite=1 regwrite=0 shifttoreg=0 extendsrc=0 bytehalf=1 fullbyhf=1,immslct=0
read_data1=00000000000000000000000000000001, read_data2=00000000000000000000000000001101100000
extendimm=0000000000000000000000000000010100, signimm=0000000000000000000000000000010100, zeroimm=0000000000000000000000000000010100
alurest=0000000000000000000000000000010111, extendimm=0000000000000000000000000000010100, aluOP=010
read_data_mem=xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
shiftregresult=0000000000000000000000000000010111, bytehalfresult=0000000000000000000000000000010111
write_data=0000000000000000000000000000010111, fullbyteresult=0000000000000000000000000000010111
```

## 10101100111110100000000000010100

```
PC=17 opcode=101011 rs=00111 rt=11010 imm=0000000000010100
aluOP=010 memread=0 memwrite=1 regwrite=0 shifttoreg=0 extendsrc=0 bytehalf=0 fullbyhf=0,immslct=0
read_data1=00000000000000000000000000000000, read_data2=000000000000000000000000000010010110
extendimm=0000000000000000000000000000010100, signimm=0000000000000000000000000000010100, zeroimm=0000000000000000000000000000010100
alurest=0000000000000000000000000000010100, extendimm=0000000000000000000000000000010100, aluOP=010
read_data_mem=xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
shiftregresult=0000000000000000000000000000010100, bytehalfresult=0000000000000000000000000000010100
write_data=0000000000000000000000000000010100, fullbyteresult=0000000000000000000000000000010100
```