Vinod Halaharvi

HUID 80778287

[halavin@iit.edu](mailto:halavin@iit.edu), [vinod.halaharvi@gmail.com](mailto:vinod.halaharvi@gmail.com)

CSCIE 93, Computer Architecture

HW1

# PROBLEM 1.17

Takes as input two 2-bit numbers and produces as output a 3-bit sum.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **A** | **B** | **C** | **D** | **Cout** | **O1** | **O0** |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 1 | 0 | 0 | 1 |
| 0 | 0 | 1 | 0 | 0 | 1 | 0 |
| 0 | 0 | 1 | 1 | 0 | 1 | 1 |
| 0 | 1 | 0 | 0 | 0 | 0 | 1 |
| 0 | 1 | 0 | 1 | 0 | 1 | 0 |
| 0 | 1 | 1 | 0 | 0 | 1 | 1 |
| 0 | 1 | 1 | 1 | 1 | 0 | 0 |
| 1 | 0 | 0 | 0 | 0 | 1 | 0 |
| 1 | 0 | 0 | 1 | 0 | 1 | 1 |
| 1 | 0 | 1 | 0 | 1 | 0 | 0 |
| 1 | 0 | 1 | 1 | 1 | 0 | 1 |
| 1 | 1 | 0 | 0 | 0 | 1 | 1 |
| 1 | 1 | 0 | 1 | 1 | 0 | 0 |
| 1 | 1 | 1 | 0 | 1 | 0 | 1 |
| 1 | 1 | 1 | 1 | 1 | 1 | 0 |

# PROBLEM 2.6

(b)

(c)

(d)

Let’s prove in the reverse direction.

Writing the terms , we get: We can do this because X + X = X

# PROBLEM 2.17

(a)

(b)

(c)

(d)

(e)

# PROBLEM 2.30

(a)

Using K-Map

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | A’B’ | A’B | AB | AB’ |
|  |  | 1 |  | 1 |
|  |  | 1 |  | 1 |

(b)

Using K-Map

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | A’B’ | A’B | AB | AB’ |
| C’ | 1 |  |  | 1 |
| C |  | 1 | 1 |  |

# PROBLEM 2.40

(a) 2 bit wide shifter

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **I0** | **I1** | **S** | **O0** | **O1** |
| 0 | 0 | 0 | 0 | 0 |
| 0 | 1 | 0 | 0 | 1 |
| 1 | 0 | 0 | 1 | 0 |
| 1 | 1 | 0 | 1 | 1 |
| 0 | 0 | 1 | 0 | 0 |
| 0 | 1 | 1 | 0 | 0 |
| 1 | 0 | 1 | 0 | 1 |
| 1 | 1 | 1 | 0 | 1 |

(b) 1 – bit demultiplexer

|  |  |  |  |
| --- | --- | --- | --- |
|  | **S** | **O0** | **O1** |
| 0 | 0 | 0 | 0 |
| 0 | 1 | 0 | 0 |
| 1 | 0 | 1 | 0 |
| 1 | 1 | 0 | 1 |

(c) 2 – bit multiplexer

|  |  |  |  |
| --- | --- | --- | --- |
|  |  | S | O0 |
| 0 | 0 | 0 | 0 |
| 0 | 0 | 1 | 0 |
| 0 | 1 | 0 | 0 |
| 0 | 1 | 1 | 1 |
| 1 | 0 | 0 | 1 |
| 1 | 0 | 1 | 0 |
| 1 | 1 | 0 | 1 |
| 1 | 1 | 1 | 1 |

# PROBLEM 2.41

(a)

O0 =

O0 = S’

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | '' | ' |  | ' |
| S' |  |  | 1 | 1 |
| S |  |  |  |  |

O1 = S’ + S

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | '' | ' |  | ' |
| S' |  | 1 | 1 |  |
| S |  |  | 1 | 1 |

(b)

O0 =S’

|  |  |  |
| --- | --- | --- |
| O0 | S' | S |
| ' |  |  |
|  | 1 |  |

O1 = S

|  |  |  |
| --- | --- | --- |
| O1 | S' | S |
| ' |  |  |
|  |  | 1 |

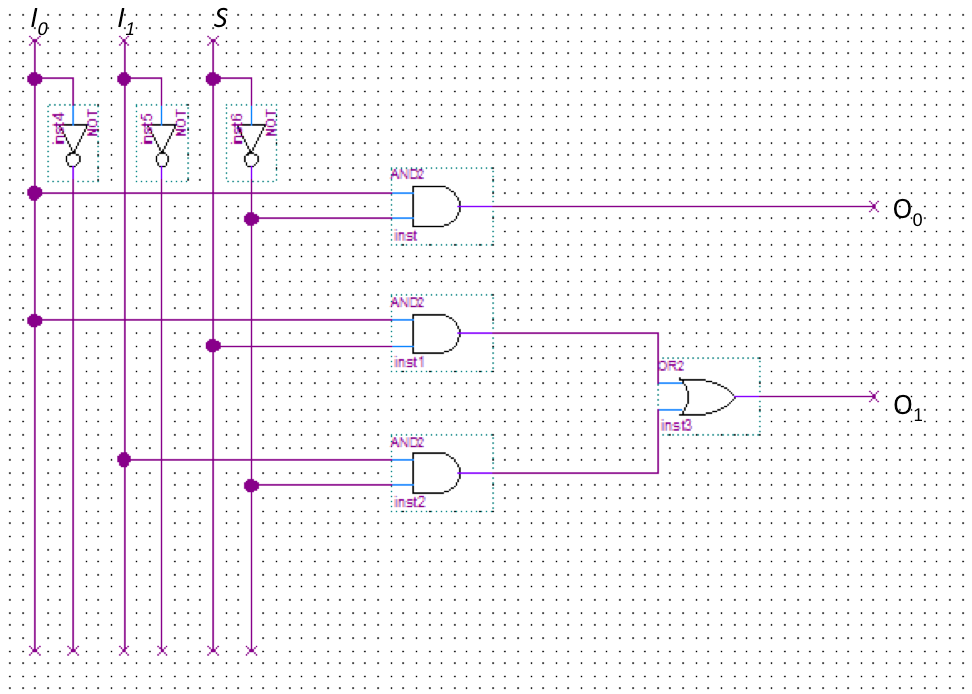
(C)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | '' | ' |  | ' |
| S' |  |  | 1 | 1 |
| S |  | 1 | 1 |  |

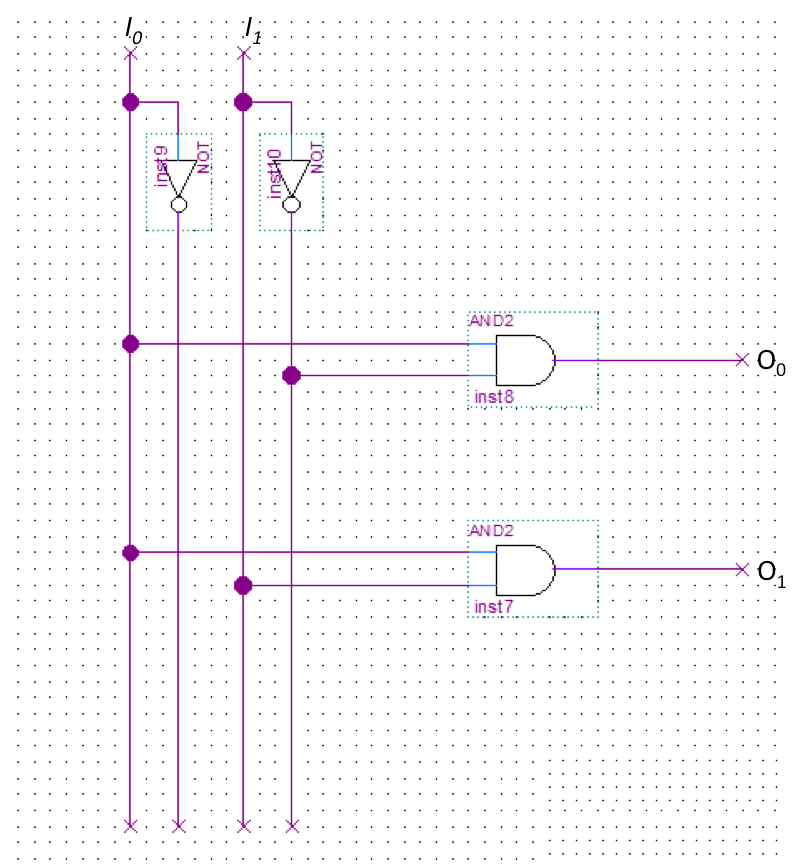
O = S + S’

# PROBLEM 2.42

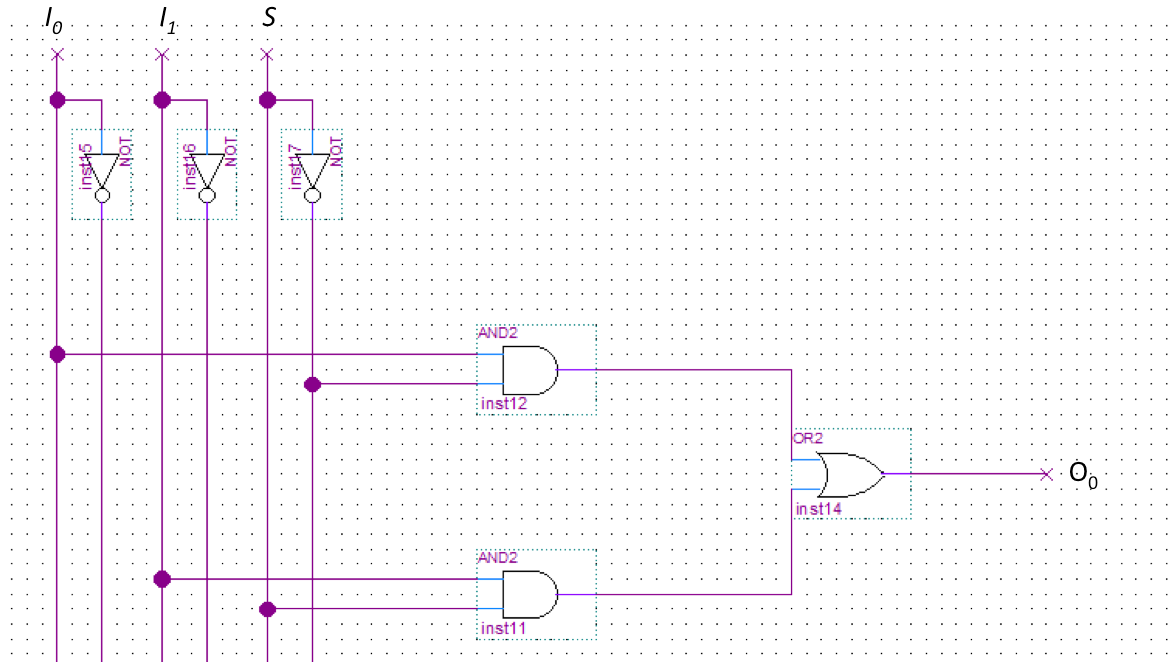
(a) O0 = S’; O1 = S’ + S



(b) O0 =S’; O1 = S



(c)



|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| N1 | N1 | N2 | N2 |  |  |
| **A** | **B** | **C** | **D** | **F** | **G** |
| X | X | X | X | X | X |
| 0 | 0 | 0 | 0 | 0 | 0 |
| 0 | 1 | 0 | 0 | 0 | 1 |
| 0 | 1 | 0 | 1 | 0 | 0 |
| 1 | 0 | 0 | 0 | 1 | 0 |
| 1 | 0 | 0 | 1 | 0 | 1 |
| 1 | 0 | 1 | 0 | 0 | 0 |
| 1 | 1 | 0 | 0 | 1 | 1 |
| 1 | 1 | 0 | 1 | 1 | 0 |
| 1 | 1 | 1 | 0 | 0 | 1 |
| 1 | 1 | 1 | 1 | 0 | 0 |