DCS Lab 06
Pattern

熊慶林

Pattern

- 這次Lab寫pattern去測錯誤的design，找到其錯誤
- 這次Lab只需要寫00_TESTBED/pattern.sv
- lab06_1.sv代表第一個spec錯誤的design，依此類推。lab06.sv 是正確的design。
- lab06_x.sv & lab06.sv 都不要動到
- 可以參考之前幾次的pattern和講義

lab06.sv

Input Signal	Bit Width	Definition
clk	1	10 ns Clock for 1 cycle
rst_n	1	Asynchronous reset when reset negedge, all output should be zero
in_number	4	範圍(-8,7)，連續給4個數字。方便之後說明，分別用in_1、in_2、in_3跟in_4代表
mode	2	幾種運算模式，請看下一頁
in_valid	1	in_valid high when giving number

Output Signal	Bit Width	Definition
out_valid	1	High for 1 cycle
out_result	7	High for 1 cycle，計算後的結果，如下頁所示

mode

需先將input四個數值(in_1~in_4)進行排序由小至大，
假設以下經過排序後sort_1最小， sort_4最大

Input signal :mode	
0	out_number = sort_1 + sort_2
1	out_number sort_2 – sort_1
2	out_number = sort_4 – sort_3
3	out_number = sort_1 – sort_4

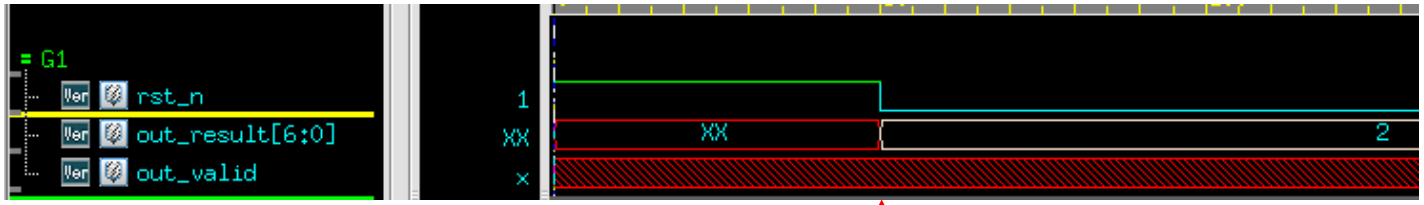
Specifications

- Top module name : lab06 (File name: lab06.sv)
- Spec1 : reset後所有的output signal要歸零
- Spec2 : 計算完吐完值後1cycle， out_valid要歸零 (out_valid只維持1cycle)
- Spec3 : outvalid 不能跟 invalid重疊
- Spec4 : 100cycle內要計算完成(out_valid為high之前)
- Spec5 : function要對(前一頁的公式會有錯要檢查出來)
- Spec6 : out_result要歸零，當out_valid是0時

- 註:請用random多跑幾組去檢測(建議100以上)

Output & Waveform

- Waveform SPEC1 error
  - reset後output signal要歸零

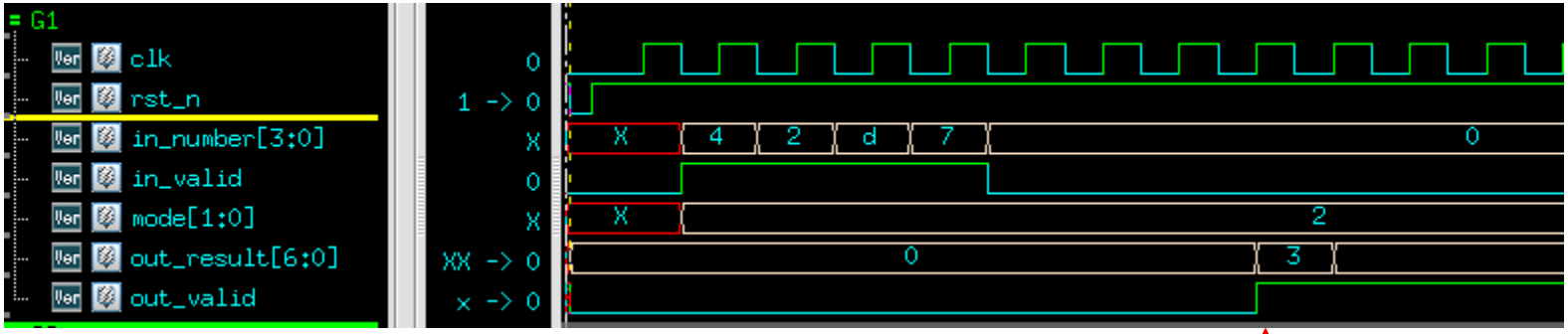


out_result , out_valid要在reset後設為0

```
SPEC1!
Reset
```

Output & Waveform

- Waveform SPEC2 error
  - 計算完吐完值後1cycle， out_valid要歸零(out_valid只維持1cycle)

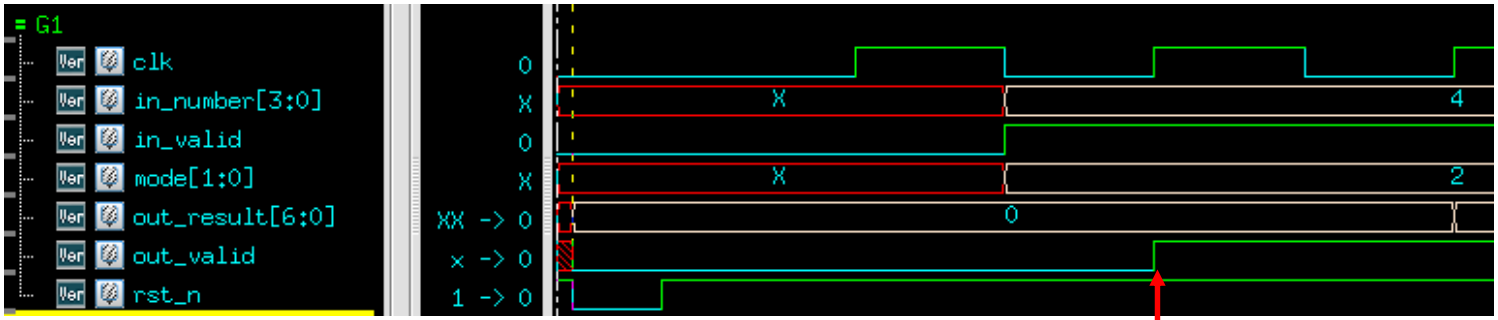


out_valid要在output後設為0
只能維持1cycle

```
SPEC2!
Output should be zero after check
```

Output & Waveform

- Waveform SPEC3 error
  - input data 給完之前， out_valid不能為high

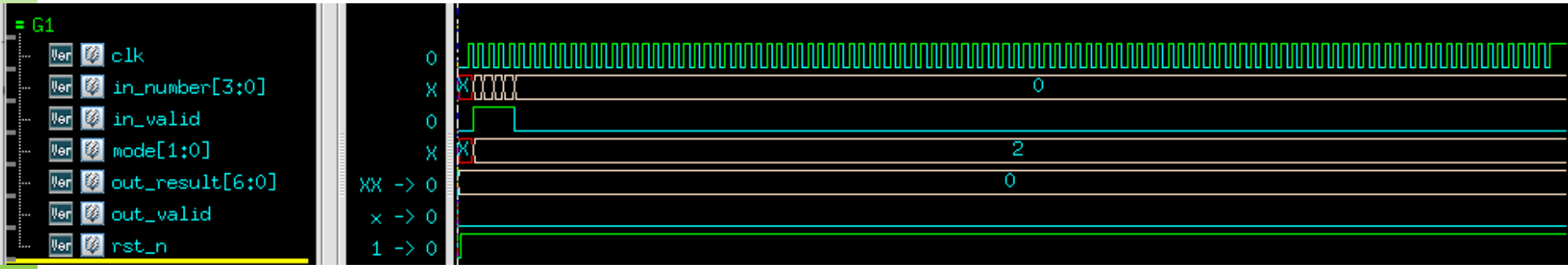


out_valid在data給完之前必須為0

```
--------------------------------------------------------
                      SPEC3!
  Outvalid should be zero before give data finish
--------------------------------------------------------
```

Output & Waveform

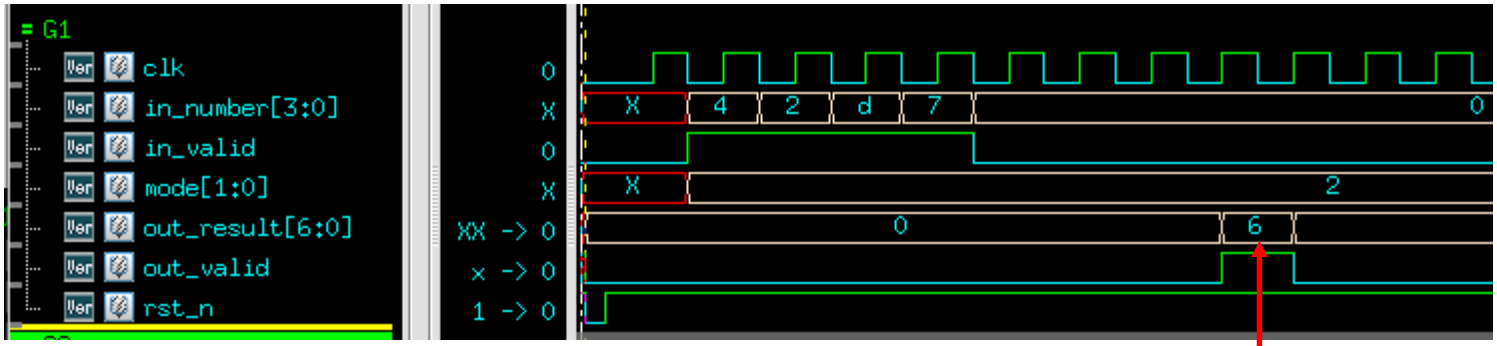
- Waveform SPEC4 error
  - 100cycle內要計算完成(out_valid為high)




```
----------------------------------------------------
                      SPEC4!
    The execution latency are over 100  cycles
----------------------------------------------------
```

Output & Waveform

- Waveform SPEC5 error
  - function要對(前幾頁的公式會有錯要檢查出來)

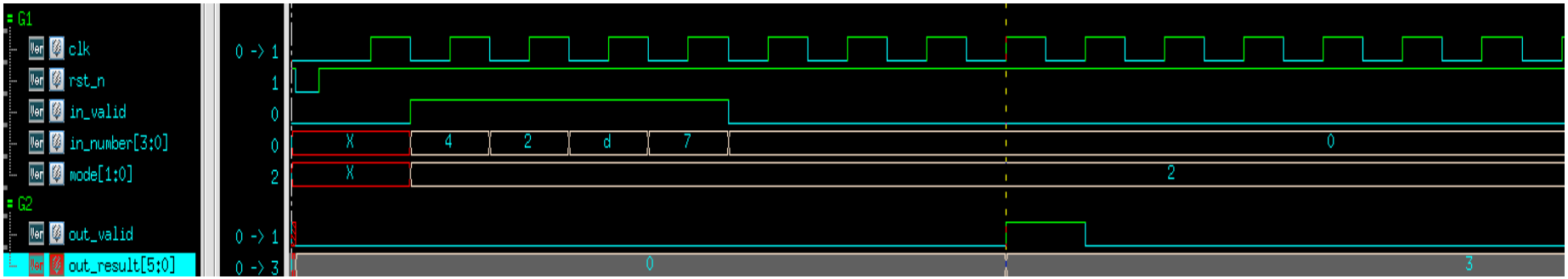


正確答案為3

```
--------------------------------------------------
                    SPEC5!
        YOUR:    6
        GOLDEN:   3
--------------------------------------------------
```

Output & Waveform

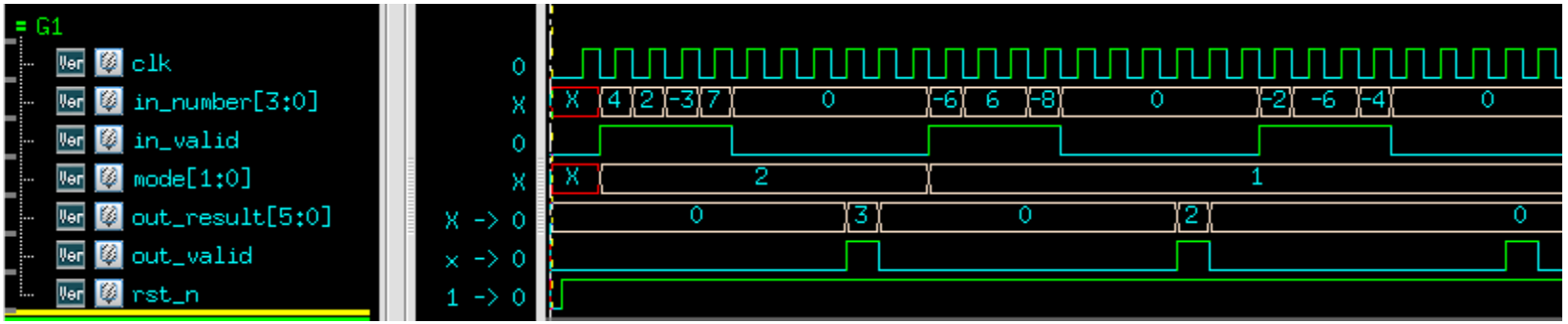
- Waveform SPEC6 error
  - out_result要歸零當out_valid為0



out_valid拉下時
out_result要歸零

Output & Waveform

- Waveform PASS
  - function要對




```
----------------------------------------
        Congratulations!
You have passed all patterns!
        time:   1001500 ns
----------------------------------------
```

(非必要)

Command

- tar -xvf ~dcsta01/Lab06.tar
- ./01_run_spec1 : run for check spec1(should display SPEC1 Fail)
- ./01_run_spec2 : run for check spec2(should display SPEC2 Fail)
- ./01_run_spec3 : run for check spec3(should display SPEC3 Fail)
- ./01_run_spec4 : run for check spec4(should display SPEC4 Fail)
- ./01_run_spec5 : run for check spec5(should display SPEC5 Fail)
- ./01_run_spec6 : run for check spec6(should display SPEC6 Fail)
- ./01_run : run for right design(should display Congratulation)
- You should Pass all spec!

Command

- 請參考pattern.sv裡這段，
  需要各自秀出SPEC1.2.3.4.5.6等資訊，
  以免助教demo時抓不到

```
$display ("------------------------------------------------------------------------------------------------------------------------");
$display ("                                                  SPEC1!                                                                ");
$display ("                                                  Reset                                                                 ");
$display ("------------------------------------------------------------------------------------------------------------------------");

$display ("------------------------------------------------------------------------------------------------------------------------");
$display ("                                                  SPEC2!                                                                ");
$display ("                                          Outvalid should be zero after check                                           ");
$display ("------------------------------------------------------------------------------------------------------------------------");

$display ("------------------------------------------------------------------------------------------------------------------------");
$display ("                                                  SPEC3!                                                                ");
$display ("                                      Outvalid should not be overlapped with invalid                                    ");
$display ("------------------------------------------------------------------------------------------------------------------------");

$display ("------------------------------------------------------------------------------------------------------------------------");
$display ("                                                  SPEC4!                                                                ");
$display ("                                    The execution latency are over 100  cycles                                          ");
$display ("------------------------------------------------------------------------------------------------------------------------");

$display ("------------------------------------------------------------------------------------------------------------------------");
$display ("                                                  SPEC5!                                                                ");
$display ("                                                 YOUR:  %d                                          ",out_result);
$display ("                                                 GOLDEN: %d                                             ",golden);
$display ("------------------------------------------------------------------------------------------------------------------------");

$display ("------------------------------------------------------------------------------------------------------------------------");
$display ("                                                  SPEC6!                                                                ");
$display ("                                      Output should be zero when outvalid is zero                                       ");
$display ("------------------------------------------------------------------------------------------------------------------------");
```

Command

- tar -xvf ~dcsta01/Lab06.tar
- Upload
  - cd 09_upload
  - ./01_upload
  - ./02_download demoX

Tips

- CYCLE 記得要給值喔~
- 不然模擬會卡住