2025 Digital IC Design Homework 2

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| **Pattern1** | **Pattern2** | **Pattern3** | **Pattern4** | **Pattern5** |
| Pass/Fail | Pass/Fail | Pass/Fail | Pass/Fail | Pass/Fail |
| **Pattern 1** | | | | |
|  | | | | |
| **Pattern 2** | | | | |
|  | | | | |
| **Pattern 3** | | | | |
|  | | | | |
| **Pattern 4** | | | | |
|  | | | | |
| **Pattern 5** | | | | |
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**LCD\_CTRL Finite-State Machine Design:**

**模組使用一個 4-bit 的 state（目前狀態）及 next\_state（下一狀態）變數來實現 FSM。狀態機依據輸入指令 (cmd) 控制執行的動作。**

**parameter write = 0, shift\_up = 1, shift\_down = 2,**

**shift\_left = 3, shift\_right = 4,**

**max = 5, min = 6, average = 7, idle = 8;**

**切換狀態:**

**always @(posedge clk ) begin**

**if(cmd\_valid && !busy)begin**

**busy <= 1;**

**next\_state <= cmd; // 依據指令決定下一狀態**

**end**

**else if(busy)begin**

**state <= next\_state;**

**end**

**end**

**若 cmd\_valid 為 1 且目前不忙碌 (busy == 0)，則將外部輸入的 cmd 指令設定為 next\_state，並設定 busy = 1 表示進入處理流程。**

**當 busy 為 1 時，則將 state 更新為 next\_state 以觸發對應操作。**