Lab 2
COMPENG 3DQ5

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The lower half of the ROM was extended to include all the uppercase letters for the LCD screen. The PS2 codes remained the same for the uppercase letters, the LCD codes were just re-mapped for the uppercase letters. Within the code, there is a flag register that keeps track of when the user is in uppercase and lowercase mode. The flag itself uses multiple if and else statements, always the least significant switch priority. From this the flag is set to either 0 or 1 to indicate upper and lowercase mode. The flag is evaluated for each character pressed and passed into the flag shift register so that each character's mode can be kept track of and this is to allow the user to be able to switch from upper to lowercase and vice versa while typing out the 16 characters for each line. The function which takes the PS2 code and looks up the LCD code uses the flag shift register at its 15th index to determine whether to look in the upper or lower half of the memory (lower or uppercase). The data register and flag register and then shifted again so the next character can be processed and displayed. In terms of finding a match or reverse match, the PS2 codes are loaded/copied into another register called match_reg which is a temporary register. There is a match and a reverse match flag, as well as a flag that determines if the current line is the top line (0) or bottom line (1). For the top match, the first 8 bits (15 to 8) are checked with the last 8 bits (7 to 0) and if they are equivalent, match is set to 1 indicating a match. Note that checking the PS2 codes will allow the code to ignore the case where upper and lower case letters are used (the PS2 codes are the same for both). Another 8 bit register called reverse_reg is used to store the last 8 characters PS2 codes but in reverse order so that a simple comparison can be done with the first 8 bits from the match_reg and the contents of the reverse_reg to determine if a reverse match is found. This is done with a for loop that runs a total of 8 iterations to copy the PS2 codes of the last 8 characters entered but in reverse order. The line flag is flipped every time the code goes to the S_LCD_ISSUE_CHANGE_LINE state. At the end, a check is done to see if either match AND the line flag are both 1 to indicate that a match was found in the top line only OR if the reverse match flag is 1 (indicating a reverse match) and the line flag is 0 (indicating we just finished with the bottom line) then to display the letter ‘d’ on the left most 7 segment display.