

- 1) The LCD panel program presented in class applies to a wide variety of popular LCD display panels that employ the Hitachi HD44780 microcontroller.
- 2) From the timing waveforms of Fig. 4.1 in the HC12 LCD display panel lecture, what logic LOW input voltage level threshold is assumed? 0.8V
- 3) From Fig. 4.1 in the HC12 LCD display panel lecture, what logic HIGH input voltage level threshold is assumed? 2.0V
- 4) What minimum E pulse duration is used when writing data to the LCD panel? 450ns
- 5) In the LCD panel program presented in class, we reduced the number of lines that must be connected to the microcontroller in the following two ways. Circle two choices!
(a) tie RS high (b) tie RS low (c) tie R/W high (d) tie R/W low (e) use only DB4:7
(f) use only DB0:3 (g) use only DB7 (h) use only DB0
- 6) Because of the simplifications listed in Question 5, we will NOT be able to:
(a) alter font size (b) control cursor blink rate (c) monitor Busy Flag (BF) (d) clear display
- 7) The data bus is transferred into the LCD display during a write operation to the LCD panel at the
(a) rising edge of E (b) falling edge of E (c) rising edge of RS (d) falling edge of RS
- 8) How long must the data be held valid before the instant it is transferred during an LCD panel write operation? 195ns
- 9) How long must the data be held valid after it is transferred during a write operation? 10ns
- 10) The LCD panel's RS line must be driven LOW (0) for at least 140 ns before E rises during a write cycle that writes a command (as opposed to an ASCII character) to the display.
- 11) When initializing the LCD panel, one important LCD Panel command is issued several times in succession? This command is called "Function Set" and it is written 5 times. This command is encoded as a byte with its upper THREE bits set to: % ~~000~~ 001. Bit #4 of this command specifies the following LCD panel option:
(a) 8 or 4 bit data bus interface (b) 1 or 2 lines (c) 5x10 vs. 5x7 dot matrix character format
- 12) An alphanumeric character may be displayed by writing its ASCII code to the panel with the LCD panel's RS control line set to HIGH (1). We must then wait at least 40 μ s before writing the next character or command to the display.
- 13) Encode the LCD panel command that will cause the next ASCII character written to the LCD display to appear six character positions to the right of Line #2. % ~~000000~~ 11000101
- 14) Encode the LCD panel command that will cause the display to be entirely cleared. % 0000001. After issuing this command we must wait at least 15200 μ s.
- 15) The LCD panel's +5 V power pin (Pin #2) is called V_{cc} for maximum contrast, the LCD panel's Vee pin (Pin #3) must be set to 0 volts. V_{ee}