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EET 241

Assignment #1

1. The LCD discussed in this section has \_\_\_\_\_\_ pins/
   1. 14
2. Describe the function of pins E, R/W, and RS in the LCD.
   1. E is the enable pin it is used by the LCD to latch information presented to its data pins
   2. R/W is the read/write input it allows the user to write information to the LCD or read information from it. R/W =1 when reading; R/W = 0 when writing.
   3. RS is the register select it is used to select the following registers. RS = 0 the instruction command code register is selected, allowing the user to send commands such as clear display, cursor at home, and so on. If RS = 1 the data register is selected, allowing the user to send data to be displayed on the LCD.
3. What is the difference between the Vcc and Vee pins on the LCD?
   1. Vcc provides +5 V the Vee is used to control the LCD contrast.
4. “Clear LCD” is a \_\_\_\_\_\_\_ (command code, data item) and its value is \_\_\_ hex.
   1. Clear LCD is a command code.
   2. Its hex value is 1
5. What is the hex value of the command code for “display on, cursor on”?
   1. E
6. Give the state of RS, E, and R/W when sending a command code to the LCD.
   1. RS = 0
   2. E = 1
   3. R/W = 0
7. Give the state of RS, E, and R/W when sending data character “Z” to the LCD.
   1. RS = 1
   2. E = 1
   3. R/W = 0
8. Which of the following is needed on the E pin in order for a command code (or data) to be latched in by the LCD?
   1. H-to-L pulse
   2. L-to-H pulse
9. True or false. For the above to work, the value of the command code (data) must already be at the D0-D7 pins.
   1. True
10. There are two methods of sending commands and data to the LCD: (1) 4-bit mode or (2) 8-bit mode. Explain the difference and the advantages and disadvantages of each method.
    1. 4-bit mode only uses 4 pins for the whereas 8-bit mode uses 8. The advantage of 4-bit mode is you can now use the LCD with only tying up 1 port on the microcontroller. The downsides are that it takes more machine cycles than the 8-bit mode would.
11. For a 16x2 LCD, the location of the last character of line 1 is 8FH (its command code). Show how this value was calculated.
    1. Address range line 1 = 80H – 8FH. 80H + FH = 8FH
12. For a 16x2 LCD, the location of the first character of line 2 is C0H (its command code). Show how this value was calculated.
    1. Address range line 2 = C0H – CFH. C0H + 0H = COH
13. For a 20x2 LCD, the location of the last character of line 2 is D3H (its command code). Show how this value was calculated.
    1. Address range line 2 = C0H – D3H. COH + 13H = D3H
14. For a 20x2 LCD, the location of the third character of line 2 is C2H (its command code). Show how this value was calculated.
    1. Address range line 2 = COH – D3H. C0H + 2H = C2H
15. For a 40x2 LCD, the location of the last character of line 1 is A7H (its command code). Show how this value was calculated.
    1. Address range line 1 = 80H – E7H. 80H + 27H = A7H
16. For a 40x2 LCD, the location of the last character of line 2 is E7H (its command code). Show how this value was calculated.
    1. Address range line 2 = C0H – E7H. C0H + 27H = E7H
17. Show the value (in hex) for the command code for the 10th location, line 1 on a 20x2 LCD. Show how you got your value.
    1. Address range line 1 = 80H – 93H. 80H + 9H = 89H
18. Show the value (in hex) for the command code for the 20th location, line 2 on a 40x2 LCD. Show how you got your value.
    1. Address range line 2 = C0H – E7H. C0H + 13H = D3H
19. In reading the columns of a keyboard matrix, if no key is pressed we should get all \_\_\_\_ (1s, 0s).
    1. 1’s
20. In the 4x4 keyboard interfacing, to detect the key press, which of the following is grounded?
    1. All rows
    2. One row at a time
    3. Both (a) and (b)
21. In the 4x4 keyboard interfacing, to identify the key pressed, which of the following is grounded?
    1. All rows
    2. One row at a time
    3. Both (a) and (b)
22. For the 4x4 keyboard interfacing (Figure 7), indicate the column and row for each of the following.
    1. D3-D0 = 0111
    2. D3-D0 = 1110
23. Indicate the steps to detect the key press.
    1. Ground all rows
    2. Wait for key press
24. Indicate the steps to identify the key pressed.
    1. Ground rows 1 at a time
    2. Check columns
    3. Is key press in this column?
    4. Scan code from table.
25. Indicate an advantage and a disadvantage of using an IC chip for keyboard scanning and decoding instead of using a microcontroller.
    1. Having an IC chip allows you to free up your microcontroller for other operations but adding an IC increases the power and size requirements of your project.
26. What is the best compromise for the answer to Problem 25?
    1. It is application specific if you can afford the extra resources to add the IC it is better to have that and let your microcontroller be available for other things if you do not have room for the IC and you don’t have room for your microcontroller to do it you may need a larger microcontroller.