Exercise Problems

LED Matrix & Keypad Projects

Design the hardware interface and write an 8086-assembly program for the following projects. The addresses of ports A, B and C of the 8255A PIA are 0H, 4H, 0AH and 0EH respectively. Assume that the forward voltage of a LED (V_D) is 2½ V, and the required current (I_D) is 6 mA.

1. The assembly program drives an 8×8 LED Matrix Display that connected to PORT A and PORT C of the 8255A PPI. It is required to display the first three characters of your Grandfather's name on the LED Matrix Display (the letters are required to appear consecutively on the LED Matrix). Use one second delay intervals between each two characters.
2. If we assume that the outer LEDs of an 8 x 8 LED matrix form the Edges of a square, write an assembly program that turns the Edges ON alternately in an anticlockwise manner, where only one Edge is ON at any time. The LED matrix is connected to PORTA and PORTC. Use one-second delay intervals.
3. If we assume that the outer LEDs of an 8 x 8 LED matrix form the Edges of a square, write an assembly program that rotates one of the LEDs at the corners of this square in a clockwise manner, where only one LED is ON at any time. The LED matrix is connected to PORTA and PORTC. Use one-second delay intervals.
4. The assembly program drives an 8×8 LED Matrix Display connected to PORT A and PORT C of the 8255A PPI. Flashing only the upper half of the matrix is required. Use one-second delay intervals.

5. The assembly program drives an 8×8 LED Matrix Display connected to PORT A and PORT C of the 8255A PPI. It is required that the two halves of the matrix (upper and lower) flash alternately. The program turns ON the upper half of the matrix (alone) for one second, then it turns ON the lower half of the matrix (alone) for one second, then repeats. Use one-second delay intervals.

6. A 4×3 keypad (shown in the figure below) is connected to the 8086 microprocessor through PORT C of the 8255A PPI (the rows are connected to PC0-PC3, and the columns are connected to PC5-PC7). Write the assembly program that detects keystrokes and displays the keys on a 7-segment display connected to PORT A of the PPI. If the pressed key is not a number, the program displays the letter E on the 7-segment (for ERROR).

7. A 3×3 keypad (shown in the figure below) is connected to the 8086 microprocessor through PORT C of the 8255A PPI (the rows are connected to PC1-PC3, and the columns are connected to PC4-PC6). Write the assembly program that detects keystrokes and displays the keys on a 7-segment display connected to PORT A of the PPI.