

1. [10 points] Write a program to calculate the decimal representation of an unsigned 8-bit integer stored at memory location 50H. The unsigned integer belongs to the set  $\{0, 1, 2, \dots, 255\}$ . The decimal representation will have 1 or 2 or 3 digits. Each decimal digit can be represented by 4 bits (also called a nibble). Store the digits at memory locations 52H and 53H as follows:
  - The ones place decimal digit occupies the least significant 4 bits at location 53H.
  - The tens place decimal digit occupies the most significant 4 bits at location 53H.
  - The hundreds place decimal digit occupies the least significant 4 bits at location 52H.
  - If the integer at memory location 50H has only 1 decimal digit, the tens and hundreds place nibbles should have zero. Similarly, if the integer has only two decimal digits, the hundreds place nibble should have zero.

**Example:** If the byte at memory location 50H is FEH, then the contents of locations 52H and 53H should be 02H and 54H, respectively.

2. [10 points] Write a program to check if a given  $m \times m$  matrix  $\mathbf{M}$  is symmetric, i.e.,  $\mathbf{M} = \mathbf{M}^T$ . The matrix dimension  $m$  is stored in 60H and the memory location corresponding to the 1st element of the matrix is 61H. If the given matrix is symmetric then set the user definable bit in program status word (PSW) i.e., set  $PSW.5$  to 1 else set it to 0. The matrix dimension  $m$  can be 2, 3, or 4. Assume the matrix  $\mathbf{M}$  to be stored in row-major form, i.e., element  $M(1, 1)$  is in the 1st location,  $M(1, 2)$  is in the 2nd location,  $\dots$ ,  $M(m, m - 1)$  is in the  $(m - 1)m$ -th location and  $M(m, m)$  in the  $m^2$ -th location.

**Example:** If the value stored in 60H is 3 and values stored in 61H, 62H,  $\dots$ , 69H are 1, 4, 3, 4, 1, 2, 3, 2, 1, respectively, then set  $PSW.5$  to 1.

## TA Checkpoints

1. For question 1, ask the student to load a byte into location 50H. Check the result of running the program is correctly stored in locations 52H and 53H.
2. For question 2, ask the student to store 3 in 60H and load a symmetric  $3 \times 3$  matrix and check that  $PSW.5$  is 1. Next load an asymmetric  $3 \times 3$  matrix and check that  $PSW.5$  is 0.