

1. [10 points] There are many scenarios where the data located in a block of consecutive memory locations in the microcontroller is copied to another location. Write a subroutine `memcpy` which does the following:

- It reads a number  $N$  from location 50H, a memory location  $M_1$  from location 51H, and memory location  $M_2$  from location 52H. The value  $N$  satisfies the constraint  $1 \leq N \leq 16$ .
- It copies the data in the memory locations from  $M_1$  to  $M_1 + N - 1$  to the locations  $M_2$  to  $M_2 + N - 1$ .

The subroutine should succeed even if the locations  $\{M_1, M_1 + 1, M_1 + 2, \dots, M_1 + N - 1\}$  and  $\{M_2, M_2 + 1, M_2 + 2, \dots, M_2 + N - 1\}$  overlap. If they do overlap, some locations in the first set will get overwritten.

**Example:** Suppose  $N = 0AH$ ,  $M_1 = 60H$ ,  $M_2 = 65H$ . Also, suppose that values 5 to 14 are in locations 60H to 69H. After calling the `memcpy` subroutine, the contents of the locations 60H through 6EH will be 5, 6, 7, 8, 9, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14.

2. [10 points] Write a program to perform signed addition of two 8-bit numbers given in 2's complement form, i.e., decimal numbers in the range  $-128, -127, \dots, 127$ . The two numbers are stored in memory locations 60H and 61H. The result is to be stored in memory location 62H. Note that the result may be wrong in case there is an overflow (i.e., result does not fall in the given range). Indicate that the result in 62H is valid or invalid by setting the general-purpose status bit `PSW.5` to 1 or 0. **Hint:** Read *Section 6.2: Signed number concepts and arithmetic operations* from Mazidi's book.

**Example:** Suppose you are to add 7FH with 7FH. Then the result stored in location 62H will be FEH and `PSW.5` to be 0.

## TA Checkpoints

1. For question 1, ask the student to load some values into 50H, 51H, 52H, and data into the locations corresponding to  $M_1 + N - 1$  at the beginning of their program before calling `memcpy`. They can use a sequence of `MOV` instructions to do this. Then ask the student to show the result of running the subroutine.
2. For question 2, ask the student to load two 8-bit values in locations 60H and 61H. Check the result of signed addition of two numbers in memory locations 62H and 63H to verify the results for both positive and negative numbers.