**Lab B-05: Programming Exercise 3**

1. Write ARM instructions to store the following block of data (32 bit words) in memory locations starting from 0x6000 to 0x6014. Subsequently, copy the data to the locations 0x7000 to 0x7014.
   Data (H): 0x01, 0x02, 0x03, 0x04, 0x05, 0x06

2. Modify Question 1 to transfer the data to the locations 0x7000 to 0x7014 in the reverse order.
   (E.g. the data byte 06H at location 0x6014 should be stored at location 0x7000.)

1.
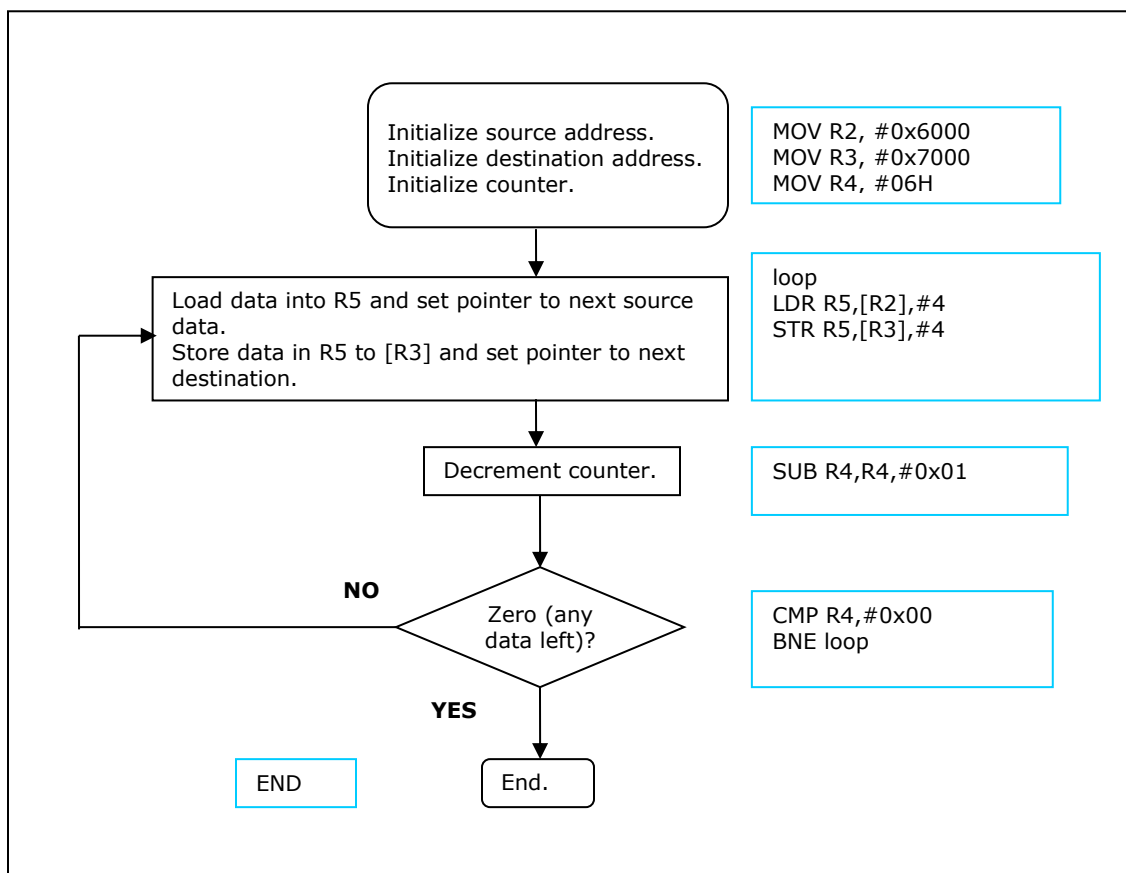
The following questions are to be included in the report only.

3. A bus that connects major computer components (processor, memory, I/O) is called a system bus.
    i.   Define the function of the system bus.
    ii.   List and describe the THREE major modules of the system bus.

4. Assume a three-stage pipeline (fetch, execute and write). Draw a timing diagram to show how many units are needed for three instructions.

5. Assume that a processor employs a memory address register (MAR), a memory buffer register (MBR), a program counter (PC), and an instruction register (IR). List the sequence of events of the instruction cycle (fetch cycle.)

6. List and describe the SIX status flags of an Intel 8086 microprocessor.

7. Assume there is a **four-stage** instruction pipeline - Fetch (F), Decode (D), Execute (E) and Write (W) running in a microprocessor. Assume that each stage requires one time unit and no branch instruction is involved.

    i.   Based on the answer in (i), how many time units are needed to complete these Six instructions with pipelining?
    ii.   By using formula, calculate the total time required to execute **SIX** instructions without pipelining.
    iii. Calculate the speedup factor for the same number of instructions.