Fundamentals of Computer Science
Homework Set 2

October 26, 2023

1. (2') What information must the CPU supply to the main memory circuitry to read a value from a memory cell? What about to write a value into a memory cell? Choose one of the following options for each case and fill it in the form (in uppercase).

A. address B. value C. address and value D. none

	Read a value	Write a value
Answer	**A**	**C**

2. (3') Consider the difference of mass storage, main memory and general-purpose registers in their usage. Determine whether the following description is correct and fill 'True' or 'False' in the forms.

2.1 Regarding the read and write latency, general-purpose registers are usually slower than main memory, and main memory are usually slower than mass storage.

2.2 The general-purpose registers are usually located inside the CPU, such as Intel Core i7 CPU for PC or Qualcomm Snapdragon 865 CPU for smartphone.

2.3 For main memory, technologies such as DRAM or SDRAM are usually used to construct random access memory (RAM). These technologies provide greater miniaturization and faster response time, but data will disappear after power off.

2.4 Compared to registers and main memory, mass storage has larger capacity and relatively lower cost, and the data can be kept after power off.

2.5 Commonly used main memory includes magnetic disk, solid-state drive (SSD), compact disc (CD), SD card, USB flash drive and mobile hard disk.

2.6 Main memory typically uses an access head and high-speed spinning disks to read and write data.

	2.1	2.2	2.3	2.4	2.5	2.6
Answer	**F**	**T**	**T**	**T**	**T**	**F**

3. (3') Here are some instructions written in natural language. Translate them into the machine language described in **Appendix C** in the textbook. Fill

a 4-character hexadecimal instruction (digits and uppercase letters) in the forms.

a) (1') LOAD the register 3 with the bit pattern found in the memory cell whose address is 6A.

Answer	**136A**

b) (1') MOVE the bit pattern found in register C to register E.

Answer	**40CE**

c) (1') JUMP to the instruction located in the memory cell at address EF if the bit pattern in register E is equal to the bit pattern in register 0. Otherwise, continue with the normal sequence of execution.

Answer	**BEEF**

4. (2') Consider the following V8 program running from address 00. What is the result of each register and address when the program halts? Fill the two-character hexadecimal data in the forms.

Address	00	01	02	03	04	05	06	07	08	09
Contents	20	A1	40	01	52	11	31	A0	C0	00

Address	**Register 0**	**Register 1**	**Register 2**	**Memory A0**
Answer	**A1**	**A1**	**42**	**A1**