

一、名词解释题 (本大题共 7 小题, 每小题 3 分, 共 21 分)。提示: 解释每小题所给名词的含义, 若解释正确则给分, 若解释错误则无分, 若解释不准确或不全面, 则酌情扣分。

1. Name the three basic components of every computer.
2. Describe how an interrupt works and name four different types interrupt at least.
3. What is the difference between synchronous buses and nonsynchronous buses?
4. Explain the differences between data buses, address buses, and control buses?
5. What is an address mode? List five types of address mode.
6. What are the advantages and disadvantages of fixed-length and variable-length instructions? Which is currently more popular?
7. Explain the concept of pipelining.

二、填空题 (本大题共 10 空, 每空 2 分, 共 20 分)。

1. the main functions of the CPU is _____.
2. What unit is typically used to measure the speed of a computer clock _____.
3. Virtual memory can be implemented with different techniques, including: _____, _____, _____.
4. List the three fields in a set associative cache address _____, _____, _____.
5. Given a memory of 2048 bytes consisting of several 32 Byte \times 8 RAM chips, and assuming byte-addressable memory, the correct way is using ____bits for chip select and ____bits for address on chip.

三、判断改错题 (本大题共 5 小题, 每小题 2 分, 共 10 分)

提示: 正确打✓, 错误打✗, 将其结果填写在下表中。

1. The Principle of Equivalence of Hardware and Software says that hardware and software are basically equivalent, and implementations done via either method will run at the same speeds.
2. Amdahl's Law states that the performance enhancement possible with a given improvement is limited by the amount that the improved feature is used.
3. Registers are storage locations within the CPU itself.
4. MARIE has a common bus scheme, which means a number of entities share the bus..
5. A fixed length instruction must have a fixed length opcode.

四、问答题 (本大题共 7 小题, 共 28 分)。

1. Write down the characteristics present in a von Neumann architecture. (4 分)

2. (1) Explain how programmed I/O is different from interrupt-driven I/O. (3 分)

(2) How does direct memory access (DMA) work? (3 分)

3. Discuss the advantages and disadvantages of dynamic linking. (4 分)

4. Explain the functions of the following codes. (4 分)

	Address	Instruction	Comments
	100	Load Addr	
	101	Store Next	
	102	Load Num	
	103	Subt One	
	104	Store Ctr	
	105	Clear	
Loop,	106	Load Sum	
	107	AddI Next	
	108	Store Sum	
	109	Load Next	
	10A	Add One	
	10B	Store Next	
	10C	Load Ctr	
	10D	Subt One	
	10E	Store Ctr	
	10F	Skipcond 00	/If control variable < 0, skip next instruction
	110	Jump Loop	
	111	Halt	
Addr,	112	Hex 118	
Next,	113	Hex 0	
Num,	114	Dec 5	
Sum,	115	Dec 0	
Ctr,	116	Hex 0	
One,	117	Dec 1	

5. Convert the following expressions from infix to reverse Polish (postfix) notation. (6 分)

a) $X \times Y + W \times Z + V \times U$

b) $W \times X + W \times (U \times V + Z)$

c) $(W \times (X + Y \times (U \times V))) / (U \times (X + Y))$

6. Suppose we have the instruction Load 500. Given that memory and register R1 contain the values below: (4 分)

Memory		
100	600	R1 200
...		
400	300	
...		
500	100	
...		
600	500	
...		
700	800	

Assuming R1 is implied in the indexed addressing mode, determine the actual value loaded into the accumulator and fill in the table below:

Mode	Value Loaded into AC
Immediate	
Direct	
Indirect	
Indexed	

五、计算题 (本大题共 2 小题, 共 21 分)。

1. (共 7 分) Suppose that a $2M \times 32$ main memory is built using $256KB \times 8$ RAM chips and memory is word-addressable. Answer the following questions and write down the reason.

- How many RAM chips are necessary?
- How many RAM chips are there per memory word?
- How many address bits are needed for each RAM chip?
- How many banks will this memory have?
- How many address bits are needed for all of memory?
- If high-order interleaving is used, where would address 14 (which is E in hex) be located?
- If low-order interleaving is used, where would address 14 be located?

2. (共 14 分) Suppose a computer using direct mapped cache has 2^{15} words of main memory, and a cache of 8 blocks, where each cache block contains 8 words. If a block is missing from cache, the entire block is brought into the cache and the access is restarted. Initially, the cache is empty.

- How many blocks of main memory are there? (3 分)
- What is the format of a memory address as seen by the cache, that is, what are the sizes of the tag, block, and word fields? (3 分)
- To which cache block will the memory reference $0x28C$ map? (3 分)
- Compute the hit ratio for a program that loops 4 times from locations 0 to 6710 in memory. (5 分)