一、名词解释题（本大题共 4 小题，每小题 3 分，共 12 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 and explain the main components of a von Neumann computer.

2. Give the two factors and four possible combinations for categorizing computer architecture in Flynn's taxonomy

3. What are the three forms of locality in memory reference?

4. Assume you have a machine that uses 32-bit integers and you are storing the hex value 1234 at address 0. Show how this is stored on a big endian machine and a little endian machine.

二、填空题（本大题共 20 个空格，每空格 1 分，共 20 分）

1. How many address lines (bits in the address) and I/O lines (bits in the actual data) are needed for each of the following word-addressable memories?
   a. 2K ×16: _____ address bits and _____ I/O lines
   b. 16K × 8: _____ address bits and _____ I/O lines
   c. 4M × 12: _____ address bits and _____ I/O lines

2. In MARIE , there are seven registers, _____ holds next instruction to be executed,_____ holds address of next instruction to be executed, _____holds memory address of data being referenced, _____ holds data written from the keyboard.

3. Name the four types of I/O architectures: _____、_____、_____、_____

4. Name three different types of buses :_____、_____、_____.

5. How many bits are required to address a 2M × 32 main memory if

a) Main memory is byte-addressable? _____

b) Main memory is word-addressable? (each word is 32bits)_____

6. Suppose that a 2M x 16 main memory is built using 256K × 8 RAM chips and memory is word-addressable.How many RAM chips are necessary? _____

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，并改正。

1. （ ）Accumulator architectures use sets of general purpose registers to store operands.

2. （ ）SRAM is faster than DRAM

3. （ ） A branch instruction changes the flow of information by changing the PC.

4. （ ） A byte is 8 bits, but a word may vary in size (16-bits, 32-bits, etc.) from one architecture to another.

5. （ ）The MAR, MBR, PC and IR registers in MARIE can be used to hold arbitrary data values.

四、简答题（本大题共 6 小题，共 38 分）。

1.（6 分）Convert the following expressions from infix to reverse Polish (postfix) notation.

a. W * (X + Y - Z)

b. U + (V * (W + (X * (Y + Z))))

c. X + ((Y + Z) * (V - W) + Z)

2. (8 分) Provide the trace for following LOAD X:

```
        100   LOAD   X
  ….
X,     10C   DEC    23
```

STEP	RTN	PC	IR	MAR	MBR	AC
(Initial value)		100	----	----	----	----
Fetch	MAR ← PC		----		----	----
	IR ← M[MAR]		110C		----	----
	PC ← PC+1		110C		----	----
Decode	MAR ← IR[11-0]		110C		----	----
	(decode IR[15-12])		110C		----	----
Get operand	MBR ← M[MAR]		110C			----
Execute	AC ← MBR		110C			

3. (8 分) In a computer instruction format, the instruction length is 11 bits and the size of an address field is 4 bits. Is it possible to have:

5 2-address instructions
45 1-address instructions
32 0-address instructions

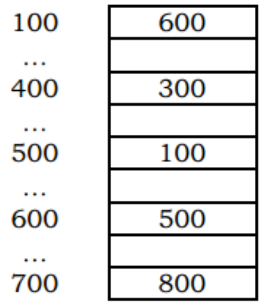
using the format? Justify your answer.

4. (6 分)Suppose a computer using set associative cache has 216 words of main memory, a cache of 32 blocks and each cache block contains 8 words.

a. If this cache is 2-way set associative, what is the format of a memory address as seen by the cache, i.e., what are the sizes of the tag, set, and word fields?

b. If this cache is 4-way set associative, what is the format of a memory address as seen by the cache?

5. (6 分)Suppose we have the instruction Load 500. Given that memory and register R1 contain the values below, Assuming R1 is implied in the indexed addressing mode, determine the actual value loaded into the accumulator and fill in the table below



R1

200

Mode	Value Loaded into AC
Immediate	
Direct	
Indirect	
Indexed	

6. （4 分）Suppose a disk drive has the following characteristics:

- 4 surfaces
- 1,024 tracks per surface
- 128 sectors per track
- 512 bytes/sector
- Tract-to-track seek time of 5 milliseconds
- Rotational speed of 5,000 RPM.

a. What is the capacity of the drive?

b. What is the access time?

五、计算题（本大题共 2 小题，共 20 分）。

提示：每小题给出了一个程序设计要求，请按照要求写出源程序代码，如果源程序代码中出现语法错误或逻辑错误，则酌情扣分。

1.（8 分）Read the following code segment in MARIE assembly language, please give the function in 3rd generation languages or natural language.

```
If,     100    Load      X       /Load X
        101    Subt      One     /Subtract 1, store result in AC
        102    Skipcond  800     /If AC>0 (X>1), skip the next instruction
        103    Jump      Else    /Branch to Else
        104    Load      X       /Load X
Then,   105    Add       One     /Add 1
        106    Store     X       /X:= X + 1
        107    Jump      Endif   /Jump over Else part
Else    108    Load      Y       /Load Y
        109    Add       One     /Add 1
        10A    Store     Y       /Y:= Y + 1
Endif,  10B    Halt              /Terminate program
One,    10C    DEC       1       /Variable One has value 1
X,      10D    DEC       ?
Y,      10E    DEC       ?
```

2.（12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.

a) How many blocks of main memory are there?

b) 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?

c) To which cache block will the memory reference 0x0B63 map?

d) Compute the hit ratio for a program that loops 4 times from locations 0 to 67_{10} in memory.