Q1:

Byte: 10101011

Signed: -43

Unsigned: 171

Short: 1000100011101001

Signed: -2281

Unsigned: 35049

Int: 100000000000000000000000000000001

Signed: -1

Unsigned: 2^31 + 1

Long: 1000000000000000000000000000000000000000000000000000000000000001

Signed: -1

Unsigned: 2^63 + 1

Q2:

A）It is in the first four bytes of the class file. The magic number is the mark of the class file. It is a fixed value: 0XCAFEBABE. If the first four bytes are not 0XCAFEBABE, then it means that it is not a class file and cannot be recognized by the JVM.

FileInputStream inputStream = new FileInputStream(file);

ClassFile classFile = new ClassFile();

classFile.magic = U4.read(inputStream);

B) The constant pool contains all the references to the class file structure and its substructures, string constants, class or interface names, field names, and other constants.

int constant\_pool\_count = U2.read(inputStream);

ConstantPool constantPool = new ConstantPool(constant\_pool\_count);

constantPool.read(inputStream);

Cp\_info{

U1 tag;

U1 info[];

}

C) holds the index of the globally qualified name of the parent class of the current class in the constant pool. It points to a CONSTANT\_Class\_info, this CONSTANT\_Class\_info data item describes the superclass information of the current class

public class Programer extends Person{

private Computer computer;

public Programer(Computer computer){

this.computer = computer;

public void doWork(){

computer.calculate();

}

D) Interfaces is a collection of interfaces used to indicate which interfaces a class implements or which interfaces an interface inherits. It is divided into two parts: interfaces\_count number of interfaces and interfaces [] interface array.

public class Plane implements IFlyable, Cloneable{

@Override

public void fly() {

}}

E) Think of it as an array, where each item in the array is a field\_info. There are a total of fields\_count field\_info in this array, and each field\_info is a description of a field.

public class Simple {

private transient static final String str ="This is a test";

}

F) methods\_count describes the number of methods defined in the current class, including static methods, but does not include methods inherited from the parent class. There are a total of methods\_count method\_info in this array, and each method\_info is a description of a method.

public void doWork();

flags: ACC\_PUBLIC

Method\_Info {

u2 access\_flag;

u2 name\_index;

u2 descriptor\_index;

u2 attribute\_count;

attribute\_info attributes[attribute\_count] }

G) attributes can be regarded as an array, each item in the array is an attribute\_info, each attribute\_info represents an attribute, and there are a total of attributes\_count attributes in the array. The attributes array records all attributes related to the class or interface.

attribute\_info {

u2 attribute\_name\_index;

u4 attribute\_length;

u1 info[attribute\_length];

}

Q3:

A) Example 1: A student sends a login request to the system, then the control layer accepts the request and send the message including the account and the password to the server layer. The server layer then asks the data layer about the password due to the account. The server layer compares the password and then returns the login result to the control layer and the control layer then express the result to the student.

Example 2: A student sends a software download request to the system, then the control layer accepts the request and send the request to the server layer. The server layer asks the data layer about the software that the student requests. The software layer then returns the software data back to the server layer and the server layer then returns it to the control layer and the control layer accepts the request of the downloading and begins upload the software to the student.

Example 3: A student sends a request of searching for the information about a certain professor. The control layer then accepts the request and send the message to the server layer. The server layer then asks the data layer about the information about the professor. The data layer then sends back the information about the professor back to the server layer and the server layer send the information back to the control layer. The control layer then expresses the result to the student.

Q4:

A) The server of TicTacToe set the socket and then listen two requests from the client class. Once a request is sent from the client, server set it as a player. When two players are set, the game begins. The server is in charge of the message transmission between the two players.

Once the client is run, it connects with the server through the same socket, and set the frame of TicTacToe. Once one player finished the role, the client sends the message to the server and server send the message to the other player. The process loops until the game is over.