**I、Fill in the blank(Each blank 1 mark, in total 5 marks)**

1. RFID has three main hardware components, and they are respectively RIFD Reader , RFID Tag , RFID Antenna .
2. According to work principle, tag antenna has three types: Coil antenna, Microstrip patch antenna and Dipole antenna .
3. If the work frequency of RFID readers becomes higher, the identification range will become further , and the data transfer speed will become higher .
4. Please list three anti-collision algorithm based on ALOHA: pure ALOHA、Slotted ALOHA、Slotted ALOHA based on frame (Frame slotted ALOHA)、Dynamic frame slotted ALOHA (DFSA)
5. RFID reader has two module components inside, and they are respectively Signal Processing & Control Module and Radio Frequency Module .

**II、True (T) or False (F) Questions（1 mark for each question, in total 4 marks）**

1.LF(low frequency) system is often used as passive tag. ( T )

2. For OOK modulation, we always set binary “1” as low frequency, binary“0”as high frequency. ( F )

3. The power of the reader need not to be usually restricted to a certain range ( F )

4. The sinusoidal modulation divides the RF signal into two signals, called sidebands. One’s frequency is higher than the carrier, and the other’s is lower than the carrier. ( T )

**III、Multiple-choice, only ONE answer.（Each blank 2 mark, in total 6 marks）**

1. The link budget of a RFID system needs to consider three aspects, which of the following is not included: (C)

A. Reader’s transmit energy B. Tag activate energy C. Antenna gain D.Path loss

1. RFID reader plays an important role as the bridge connecting the ( B ) layer and RFID tags.

A. Network B. Application C. Presentation D. Data Link

1. In FSA algorithm, the length of frame is fixed, when the number of tag is much larger than the number of frame, the probability of collision (A )
2. A、increase B、decrease C、keep same D、can’t sure

**IV、Short Answer Questions（in total 10 marks）**

**Question 1. (5 marks) Please list four main features of RFID and explain them in details**

a) Permanently store a certain amount of data

RFID tag has a user storage area, which can store 1KB-10KB of user data.

b) Simple logical processing

RFID has a very limited number of internal logic gates, so only a simple logical processing can be made. But the RFID system can use the basic logic processing ability of tags to achieve some effective protocols and algorithms to improve the system operating efficiency and security performance.

c) Reflection signal strength is affected by the distance and other factors significantly

Since the RFID tag itself is a passive device, the feedback signal must be modulated by backscatter. Therefore, the strength of the RFID tag reflection signal is susceptible to the surrounding environment, including distance, reader power, signal interference, and tag deployment density.

d) Low cost, can be deployed at a large scale

RFID tags tend to large-scale mass production using printed circuits, so manufacturing costs can be significantly reduced. At present, the cost of an RFID tag can be controlled at around 10 cents.

**Question 2. (5 marks) Please compare slot-Aloha and frame based slot-Aloha algorithm, and explain why do we need the frame based slot-Aloha in practice. In addition, please explain in brief how Q-algorithm works.**

Slot-Aloha divides the time of the pure ALOHA algorithm into several time slots, each slot is greater than or equal to the time length to send tag identifier, and each tag can only send an identifier at the beginning of the slot. Due to the time synchronization of the system, the channel utilization of the s-ALOHA protocol is 36.8%, which is twice of the pure ALOHA.

Frame slotted ALOHA is based on S-ALOHA. Several time slots are organized into one frame, and the reader identify tags by frame.FSA algorithm has many advantages, such as simple logic, simple circuit design, less memory requirement, and the only one randomly sent in the frame further reduces the probability of conflict.

Q Algorithm: used in Dynamic frame slotted ALOHA algorithm. It is a commonly used frame length adjustment method. when there are too many slot conflicts in one frame, the reader will end the frame ahead of time and resend a larger frame. When there are too many idle slots in one frame, the reader will end the frame ahead of time and restart a smaller frame.