Huawei HCIA-IoT v. 2.5

Evaluation Questions

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Preface

This document is oriented towards students preparing for the exam of Huawei Certified Information and communication technology Associate (HCIA-IoT) v. 2.5. The main idea of this booklet is to provide students with an evaluation tool for their understanding of the course content. This booklet is not an exam dump, and it should never be handled like that.

HCIA-IoT is a course prepared provided by Huawei. It focuses on the Internet of things explaining the technologies used to support it, such as 5G and NB-IoT. It also introduces Huawei products and solutions in this domain.

The structure of this document follows the chapters of the course. For each chapter, there are two groups of questions: True or false and multiple choices questions. Additionally, the booklet includes a table for abbreviations used in this course in alphabetical order.

I recommend the following steps to maximize the benefits of this document (Figure1):

1. Read the targeted chapter from the course support.
2. Try to answer the questions associated with the targeted chapter in this document.
    a. If you succeed (more than 90% of answers are correct), go forward for the next chapter.
    b. If not, go backward and study the targeted chapter with more careful.

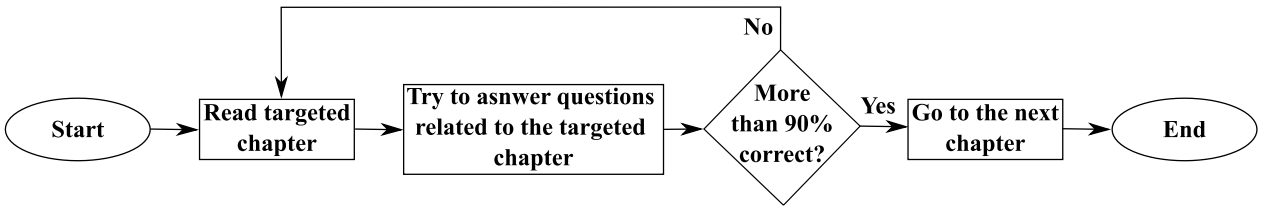

Figure 1: Flow chart explaining a proposed mechanism to address this booklet.

I had the chance to work with Huawei in France in February and March 2021. In this period, I prepared this document. Unfortunately, the spread of COVID-19 was at its highest rates. The course had to follow very strict instructions of the local authorities. However, we were able to touch physical materials and develop several labs using IoT Huawei developer kit.

Paris

15-03-2021

Attention: Studying this document only is not enough to pass the official exam.

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Chapter 1. IoT development history and Overview

A. Mark the following <u>True or False</u>?

1. The Trojan room coffee pot of the computer laboratory in Cambridge University is an example of an IoT solution.
2. ITU referred to the IoT concept at the world summit on the information society in 2005.
3. NB-IoT is developed for 5G technologies.
4. The first 3GPP standard for the 5G is Release-16.
5. VR glasses, body fat scales, smart locks, and smart speakers are examples of industry-related IoT products.
6. Smart agriculture is an example of industry-related IoT products.
7. IoT is an Internet where all things are interconnected.
8. IoT requires moving from the internet of things to the internet of people.
9. IoT model includes 4 layers.
10. In the IoT model, the platform layer collects Information and process signals.
11. Huawei IoT solution architecture is 1+2+1.
12. Huawei cloud IoT platform is open, pre-integrated and access-dependent.
13. Bluetooth is an example of communication protocols used by IoT applications.
14. Fully open smart ONT requires a bit rate up to 1 Gbit/s.
15. In the IoT model, device management and security maintenance are performed by the platform.
16. Huawei IoT Solution Architecture is 1+2+1 means: one IoT access method, two platforms, and one IoT operating system.
17. Huawei LiteOS features low power consumption, small size, and quick response.
18. NB-IoT stands for NearBand Internet of Things.
19. Huawei LiteOS features basic kernel size less than 20 kB.
20. 5G Architecture supports both NFV and SDN.

B. Choose the correct answer, there is <u>only one correct answer</u> for each question:

1. Which of the following is considered the oldest known mention of IoT:

   A. Bill Gates Book (the road ahead)
   B. ITU internet reports.
   C. Trojan room coffee pot
   D. Hannover messe

2. In which release of the 3GPP the NB-IoT standard was frozen?

   A. 13
   B. 14
   C. 15
   D. 16

3. Which of the following chinese mobile operator(s) was(were) the first 5G network(s) commercially used?

   A. China Telecom
   B. China Mobile
   C. China Unicom
   D. All of them

4. In which quarter of 2019 the 5G networks were employed in china for public commercial use?

   A. First
   B. Second
   C. Third
   D. Fourth

5. Development of IoT industry is driven by:

   A. Consumers
   B. Policies
   C. Industry
   D. All of them

6. One of the following is not a policy-driven application of the IoT industry:

   A. Firefighting
   B. Smart agriculture
   C. Parking
   D. Streetlightning

7. One of the following is consumption-driven application of the IoT industry:

   A. Smart speaker
   B. Public utilities
   C. Security system integration
   D. Internet of Vehicles

8. Which of the following is industry-driven application of the IoT industry?

   A. Smart agriculture
   B. Smart logistics
   C. IoV
   D. All of them

9. From 1999 to 2013, the term “connected objects” was used to describe:

   A. Smart wearable devices
   B. Smart home utilities
   C. Things in the radio frequency domain
   D. Industrial devices and applications

10. How many layers are there in the IoT model?

    A. 2
    B. 3
    C. 4
    D. 5

11. Which of the following layer of the IoT model provide data presentation and costumer interaction services?

    A. Application layer
    B. Platform layer
    C. Network layer
    D. Device layer

12. One of the following is not a component of the platform layer in the IoT model:

    A. Cloud data center
    B. Operations platform
    C. IoT gateways
    D. Security maintenance

13. Which of the following is a network layer technology in the IoT model?

A. GPRS
B. NB-IoT
C. 4G
D. All of them

14. One of the following is not an example of an IoT applications:

A. Smart home
B. Huawei LiteOS
C. Safe city
D. IoV

15. Which of the following solutions for the IoT model architecture are proposed by Huawei?

A. 1+2+1
B. 2+1+1
C. 2+1+2
D. 1+1+2

16. The adapted Huawei IoT architecture includes:

A. Two IoT platform, two access methods and one IoT operating system
B. One IoT platform, two access methods and one IoT operating system
C. One IoT platform, two access methods and two IoT operating system
D. None of them

17. One of the following is not an example of protocols used in the NB-IoT end-to-end solution:

A. HTTP
B. MQTT
C. ICMP
D. CoAP

18. One of the following is not an example of devices used in the NB-IoT end-to-end solution:

A. MCUs
B. Modules
C. NB-IoT chipsets
D. HTTP

19. Which of the following connectivity is required in a smart home using ONT technology?

A. 1 Mbit/s
B. 1 Gbit/s
C. 1 Tbit/s
D. None of them

20. Huawei cloud IoT platform is:

A. Open
B. Pre-integrated
C. Service-oriented
D. All of them

Chapter 2. IoT Industry Applications and Solutions

A. Mark the following <u>True or False</u>?

1. Traffic management is a common problem in modern cities.
2. Environmental sanitation is not included in the city management scenario.
3. Device management in the smart city solution includes: 2G/3G/4G, fixed and NB-IoT accesses.
4. Smart streetlamp services do not include charging piles.
5. Smart manhole cover solution can provide real-time monitoring.
6. Security management is a common problem in campus management.
7. Power consumption management is not covered in the smart campus solution.
8. In the campus solution, facial recognition can be used to manage visitors.
9. NB-IoT is a common technology used to manage security in the smart campus solution.
10. AMI stands for Advanced Metering Interface.
11. Randomness is a character in the desired AMI solution.
12. V2X includes V2N, V2I, V2P, and V2V.
13. DRIS consists of V2X server and V2X edge.
14. DRIS and HUD can be integrated in an IoV solution.
15. DRIS stands for Driver Road Infrastructure Service.
16. It is not necessary in an ICT-based production system of smart manufacturing to include intelligent sensing technologies.
17. In 5IABCDE, E stands for Encryption.
18. 5IABCDE includes five emerging technologies.
19. Block chain is included in 5IABCDE.
20. AIoT stands for Advanced Internet of Things.

B. Check the correct answer, there is only one correct answer for each question:

1. One of the following is not a common problem in modern cities:

   A. Visitor management
   B. Parking management
   C. Street lamp management
   D. Manhole cover management

2. Smart city solution includes:

   A. 2G/3G/4G and fixed access
   B. NB-IoT access
   C. None of them
   D. Both of them

3. One of the following is not in the application layer for smart firefighter solution:

   A. Alarm handling
   B. Remote muting
   C. Traffic broadcast
   D. Device self-check

4. One of the following is not used in the smart parking solution:

   A. NB-IoT modules
   B. Huawei IoT platform
   C. IoT agent
   D. RRU+Antenna

5. Which of the following protocol(s) is(are) used in the network layer in the smart fire fighting solution?

   A. SNMP
   B. HTTP
   C. CoAP
   D. All of them

6. Which of the following is a common problem in an traditional campus?

   A. Lack of sensing
   B. Visitor management
   C. None of them
   D. Both of them

7. In a smart campus solution, facial recognition uses one of the following:

   A. Video- assisted alarm acknowledgment
   B. Intelligent pre-event warning
   C. System linkage handling
   D. Blacklist-based surveillance

8. One of the following is not used in the power consumption management in the smart campus solution:

   A. Temperature/humidity sensor
   B. Geo-magnetic vehicle detector
   C. Intelligent switch/motion sensor
   D. Smart electricity/water meter

9. Electrical power supply system does not include:

   A. Power generation
   B. Power transformation
   C. Power distribution
   D. Power storage

10. Which of the following is(are) a character(s) of traditional grid?

    A. Simultaneity
    B. Integration
    C. Integration
    D. All of them

11. In the AMI solution, one of the following is not used in the field area network:

    A. LTE
    B. Microwave
    C. Zigbee
    D. Wireless LAN

12. In the AMI solution, NAN stands for:

    A. Node Area Network
    B. Neighborhood Area Network
    C. NB-IoT Area Network
    D. None of them

13. One of the following is not used as a device in the smart AMI solution:

A. Three-phase prepaid meter
B. Wireless smoke sensor
C. Single-phase prepaid meter
D. Data concentrator unit

14. Which of the following is not a connection name in IoV environment?

A. V2V
B. V2N
C. V2I
D. V2E

15. One of the following is not considered as a vehicle device in IoV solution:

A. T-Box
B. Rearview mirror
C. Cabinet meter
D. Vehicle-mounted screen

16. Which of the following is not a part of the seven-emerging technologies?

A. 4G
B. 5G
C. IoT
D. AI

17. “B” in 5IABCDE stands for:

A. Big data
B. Block chain
C. 5G
D. None of them

18. AI does not include:

A. Speech recognition
B. Image recognition
C. Edge computing
D. Natural language processing

19. AIoT includes:

A. Edge computing
B. Image recognition
C. Block chain technologies
D. Hybrid networking

20. Digital twin includes:

A. Physical products

B. Virtual products

C. Both of them

D. None of them

Chapter 3. IoT Security Technologies

A. Mark the following True or False?

1. The Tesla incident is classified as a DDoS attack.
2. In the Tesla incident, the network layer of the IoT architecture was attacked.
3. DDoS stands for Distributed Denial of Service.
4. Data interception and tampering is not considered as a security threat.
5. API attacks are categorized as a pipe threat.
6. Pipe detection, cloud-cloud synergy and trusted device authentication are effective means to resolve security threats.
7. Huawei IoT security system provides security to data, access and devices.
8. In the Huawei IoT security system, digital signature process includes the use of RSA2048 or SHA256.
9. In the Huawei IoT security system, the use of digital signature includes generation of public and private keys.
10. In the Huawei IoT security system, the signature verification is provided by the terminal device.
11. During the last two decades, the attackers' capability level has increased.
12. Password guessing is an example of IoT attacks.
13. DoS, phishing and encryption are examples of network attacks.
14. In recent days, requirements on attackers' capabilities are low.
15. As requirements on attackers' capabilities are decreasing, attackers' capability level is decreasing as well.
16. AI-based attacks and ransomware viruses are examples of attack tools developed in the 2010s.
17. 3T+1M means 3 security tires and 1 management layer.
18. Anti-DDoS and signaling storms are part of the pipe security.
19. A priority-based system is an anti-DDoS tool.
20. The two-factor authentication can include: certificate and password.

B. Check the correct answer, there is <u>only one correct answer</u> for each question:

1. In Tesla incident, the hackers attack the:

   A. Inter-vehicles connections
   B. In-vehicle system
   C. Vehicle-gateway interconnection
   D. All of them

2. In the context of Mirai malware attack, "Zombies" refer to:

   A. Network cameras
   B. Digital video recorders
   C. Intelligent routers
   D. All of them

3. One of the following is not categorized as application threat for the LPWA security:

   A. Invalid security access control
   B. Incorrect security configurations
   C. API attacks
   D. Sensitive information leakage

4. Which of the following is not a security threat to the IoV system?

   A. DDoS attacks/signaling storms
   B. API attacks
   C. T-Box communication security threats
   D. Bluetooth vulnerabilities

5. Trust key attacks are LPWA security threat, they fill into one of the following category:

   A. Application
   B. Platform
   C. Network (pipe)
   D. Device

6. Which of the following is device security threat?

   A. Unencrypted transmission
   B. Checking of damaged devices
   C. None of them
   D. Both of them

7. During the last two decades, as the network attack technologies become more sophisticated, the requirements on attackers' capabilities:

   A. Raised up
   B. Stayed the same
   C. Dropped down
   D. Become also sophisticated

8. Which of the following tools is(are) used to attack IoT networks?

   A. APT attacks
   B. AI-based attacks
   C. Ransomware viruses
   D. All of them

9. Which of the following architecture does Huawei IoT security adopt?

   A. 3T+1M
   B. 1T+3M
   C. 3T+2M
   D. 3T+3M

10. Which of the following is(are) included in the IoT security solution?

    A. Data security
    B. Access security
    C. Device security
    D. All of them

11. One of the following is not included in the Huawei IoT defense of big data security:

    A. Machine learning
    B. Anti-DDoS
    C. Threat response
    D. Attack detection

12. Implementation of FOTA digital signature includes using of the following algorithm(s):

    A. RSA2048
    B. SHA256
    C. Both of them
    D. None of them

13. The digital signature operation includes the use of:

A. Two public keys
B. Two private keys
C. One public and one private keys
D. Only a private key

14. Pipe security mechanism for IoT solution includes:

A. Anti-DDoS
B. Firmware validity
C. Both of them
D. None of them

15. A priority-based mechanism against anti-DDoS includes:

A. Congestion management
B. Delay access mechanism
C. Both of them
D. None of them

16. In the digital signature algorithm, the signature creation is done at the:

A. Core of the network
B. Terminal devices
C. Gateway
D. Cloud

17. One of the following is not an attack tool:

A. Password cracking
B. Encryption
C. Password guessing
D. Phishing

18. Which of the following is not used in the two-factor authentication?

A. Certification
B. SMS
C. Digital signature
D. Password

19. In the bicycle sharing scenario, which of the following mechanism(s) is(are) used?

A. One-way authentication

B. Dual authentication

C. Both of them

D. None of them

20. In the context of bicycle sharing scenario, “DICE” stands for:

A. Device Identifier Composition Engine

B. Digital Identifier Composition Engine

C. Digital Identifier Center Engine

D. Digital Interconnection Composition Engine

Chapter 4. Overview of Common IoT Communications Technologies

A. Mark the following <u>True or False</u>?

1. Ethernet uses CSMA/CA to detect collisions.
2. FE stands for Fast Ethernet.
3. Micro-B is a USB port Type.
4. USB 4.0 bit rate can go up to 40 Gbit/s.
5. In M-Bus technology, the power supply capability of the bus is 10 A.
6. Bluetooth includes three types: BR/EDR, BLE and BLF.
7. Wi-Fi can use 2.4 GHz UHF or 5 GHz SHF ISM radio frequency bands.
8. GPRS bit rate is 9.6 kbps.
9. UMTS is categorized as 2.5G.
10. IMT-Advanced is the official name of 4G.
11. LTE UE category 1 supports a downlink bit rate of up to 10 Mbit/s.
12. 5G application scenarios are eMBB, mMTC and URLLC.
13. Commercial use of the 5G started in 2020.
14. NB-IoT is categorized as LPWA communication technology.
15. SigFox bit rate is 1000 bit/s.
16. 3G, 4G and 5G are considered high-rate and long-range technologies.
17. Smart meter reading scenarios can use small-packet and ultra-long-range technology such as 3G.
18. Wi-Fi and Bluetooth are considered high-rate and short-range technologies.
19. NB-IoT and LoRa are low-speed connection technologies.
20. Z-Wave coverage can extend to 1 km.

B. Check the correct answer, there is only one correct answer for each question:

1. One of the following is not a wired communication technology:

   A. Ethernet
   B. LTE
   C. PLC
   D. USB

2. One of the following is not a wireless communication technology:

   A. Wi-Fi
   B. Zigbee
   C. LoRa
   D. RS-232

3. Which of the following is not considered as a cellular mobile network technology?

   A. UMTS
   B. GSM
   C. PLC
   D. LTE

4. Which of the following is(are) considered as short-range wireless communication technology(ies):

   A. Wi-Fi
   B. Zigbee
   C. Bluetooth
   D. All of them

5. LTE-Advanced Pro belongs to:

   A. 2G
   B. 3G
   C. 4G
   D. 5G

6. One of the following is not a 3G technology:

   A. UMTS
   B. GPRS
   C. HSPA
   D. HSPA+

7. GSM data rate is in the range of:

   A. kbit/s
   B. Mbit/s
   C. Gbit/s
   D. Tbit/s

8. 5G connection density is:

   A. 10^4 connections/km^2
   B. 10^5 connections/km^2
   C. 10^6 connections/km^2
   D. 10^7 connections/km^2

9. 5G supports mobility at the speed of:

   A. 200 km/h
   B. 300 km/h
   C. 400 km/h
   D. 500 km/h

10. One of the following is not a 3G technology:

    A. FDMA
    B. TD-SCDMA
    C. CDMA2000
    D. WCDMA

11. AR, VR and MR are supported in the:

    A. 3G
    B. 4G
    C. 5G
    D. All of them

12. In which of the following LPWA technology, the coverage can extends to 50 km?

    A. SigFox
    B. LoRa
    C. NB-IoT
    D. eMTC

13. The bandwidth used for LPWA NB-IoT is:

    A. 180 MHz
    B. 180 kHz
    C. 18 MHz
    D. 18 kHz

14. LPWA NB-IoT supports mobility scenarios with a speed less than:

A. 80 km/h
B. 100 km/h
C. 200 km/h
D. 500 km/h

15. eMTC is developed by:

A. Nokia
B. Ericsson
C. Huawei
D. None of them

16. Which of the following has the lowest typical transmission rate?

A. SigFox
B. LoRa
C. NB-IoT
D. eMTC

17. Video surveillance requires:

A. Low data rate and high bandwidth
B. High data rate and high bandwidth
C. High data rate and low bandwidth
D. Low data rate and low bandwidth

18. Smart meter applications require:

A. High data rate
B. High bandwidth
C. None of them
D. Both of them

19. Which of the following require 5G?

A. Video surveillance
B. IoV
C. None of them
D. Both of them

20. Small packet and short-range technologies includes:

A. eMTC

B. LoRa

C. Z-Wave

D. SigFox

Chapter 5. NB-IoT Communication Technologies and Solutions

A. Mark the following True or False?

1. NB-IoT and NR can coexist.
2. The industry recognizes NB-IoT evolution and agrees to incorporate it into the overall 5G plan.
3. NB-IoT bandwidth is 200 kHz.
4. NB-IoT downlink has 12 subcarriers each is 15kHz.
5. OFDMA is an evolution of OFDM that combines it with FDMA.
6. NB-IoT technology supports massive connections but it consumes remarkable amount of energy.
7. PSM stands for Power Sleeping Mode.
8. In NB-IoT technology, PSM consumes the most amount of energy.
9. NB-IoT uses retransmission over the air interface and ultra-narrow bandwidth to provide an extra gain of over 20 dB compared with GSM.
10. NB-IoT is based on cellular networks and coexists with other networks of this type.
11. NB-IoT standalone deployment is only based on LTE.
12. NB-IoT supports three deployment modes.
13. NB-IoT on the Boudica 150 chip supports full duplex channel.
14. DRX period can be 1.28, 2.56, 5.12 or 10.24s, and it is determined by the operator's network.
15. The maximum eDRX period is 2.92 hours.
16. An IoT device can be in the dormant state for up to 99% of the total time.
17. PSM maximum period is 200 hours.
18. Because NB-IoT uses repeated transmission, the downlink gain increased by 12 dB and the uplink gain increased by 9 dB.
19. NB-IoT is a wide coverage technology.
20. NB-IoT is not an example of LPWA communication technologies.

B. Check the correct answer, there is only one correct answer for each question:

1. LPWA stands for:

   A. Long-Power Wide-Area
   B. Low-Power Wide-Area
   C. Large-Power Wide-Area
   D. Low-Person Wide-Area

2. Power transmission gain in the basic version of LPWA was:

   A. 20 dB
   B. 10 dB
   C. 5 dB
   D. 25 dB

3. NB-IoT and NR technologies:

   A. Work separately only
   B. Can coexist
   C. Interfere with each other
   D. None of them

4. Boudica 150 chip supports:

   A. Multicast
   B. Downlink: 21.2 kbps, uplink: 15.6 kbps
   C. Positioning
   D. All of them

5. One of the following is not true about Boudica 120, it:

   A. Supports paging
   B. Has 20 dB coverage enhancement
   C. Supports IP only
   D. Supports single tone

6. At the physical layer of NB-IoT, the bandwidth is:

   A. 150 kHz
   B. 180 kHz
   C. 120 kHz
   D. 200 kHz

7. At the physical layer of NB-IoT, uplink technology is:

   A. OFDMA
   B. SC-FDMA
   C. TDMA
   D. CDMA

8. One of the following is not an NB-IoT feature:

   A. Ultra-low cost
   B. Massive connections
   C. Ultra-high power consumption
   D. Ultra-wide coverage

9. NB-IoT deployment mode(s) is(are):

   A. Standalone
   B. Guard band
   C. In-band
   D. All of them

10. Standalone deployment mode is used with:

    A. GSM
    B. UTMS
    C. LTE
    D. All of them

11. Kirin 4G chip supports:

    A. Broadband
    B. High bit rate
    C. Full duplex
    D. All of them

12. PSM consumption pattern can last up to:

    A. 300 hours
    B. 210 hours
    C. 310 hours
    D. 350 hours

13. Deep coverage solution provides gain increasing by:

    A. 5 dB
    B. 11 dB
    C. 20 dB
    D. 25 dB

14. NB-IoT gain in the repeated transmission is:

A. Decreased both in the uplink and downlink

B. Increased both in the uplink and downlink

C. Increased in the uplink only

D. Increased in the downlink only

15. Which of the following technologies has the highest maximum coupling loss?

A. LTE

B. GPRS

C. NB-IoT

D. GSM

16. NB-IoT increases battery life to be:

A. 5 years

B. 7 years

C. 10 years

D. 12 years

17. Which of the following is the number of connection per cells supported by NB-IoT?

A. 5000

B. 50 000

C. 100 000

D. 150 000

18. One of the following is not true about NB-IoT:

A. Evolution is based on the live network

B. Operator-level reliability

C. High security

D. Local roaming

19. NB-IoT solution architecture includes:

A. 3 layers

B. 4 layers

C. 5 layers

D. None of them

20. Which of the following solution can include NB-IoT?

A. Smart parking

B. Shared bikes

C. Smart streetlamp

D. All of them

Chapter 6. 5G Communications Technologies and Solutions

A. Mark the following <u>True or False</u>?

1. NR stands for New Reality.
2. Massive MIMO supports 64 transceiver antennas and 64 for receivers.
3. Release 15 is the first 3GGP standard dedicated for 5G.
4. In 5G, E2E latency is 10 ms.
5. Compared to the 4G technology, latency in 5G is 30 to 50 times less.
6. The throughput of 5G can go up to 10 Mbps.
7. Compared to the 4G technology, throughput in 5G is 100 times higher.
8. 5G can support a number of connections per km^2 up to 1 million.
9. Compared to the 4G technology, 5G supports 1000 times the number of connections.
10. 4G and 5G supports slicing.
11. IMT-Advanced is another name for 5G.
12. SDN stands for Software-Driven Networking.
13. NSA can coexist with SA.
14. eNB stands for evolved NodeB.
15. 5G New Radio can be full duplex or half duplex.
16. 5G New Radio supports Massive MIMO.
17. Sub-3 GHz means lower than 3000 MHz and C-band covers 3000 - 6000 MHz.
18. 5G New Radio extends to the visible light band.
19. In 5G, URLLC scenarios need to provide ultra-high reliability and ultra-low latency services.
20. VR, AR and MR are examples of eMBB scenarios.

B. Check the correct answer, there is only one correct answer for each question:

1. 3GPP process of the 5G standardization started in:

   A. Release 14
   B. Release 15
   C. Release 16
   D. Release 17

2. Which of the following standard(s) can benefit from the 5G?

   A. WiMax
   B. WCDMA
   C. LTE
   D. All of them

3. One of the following is not true about the 5G, it provides:

   A. Global unified standardization
   B. Global roaming
   C. Massive connections
   D. Bit rate up to 1Tbit/s

4. Compared to LTE, the throughput of the 5G is:

   A. 10 times greater
   B. 100 times greater
   C. 1000 times greater
   D. None of them

5. Compared to LTE, the number of connections of 5G is:

   A. The same
   B. 10 times greater
   C. 100 times greater
   D. 1000 times greater

6. In 5G, the latency is around:

   A. 0.1 msec
   B. 1 msec
   C. 10 msec
   D. 100 msec

7. How many connections per km^2 can a 5G network support?

   A. 10^3
   B. 10^4
   C. 10^5
   D. 10^6

8. In terms of spectral efficiency, and compared to IMT-advanced, IMT-2020 can provide:

   A. The same efficiency
   B. Less efficiency
   C. 3 Times more
   D. 10 Times more

9. Which of the following is not true about 5G? it:

   A. Uses low and high frequency bands
   B. Creates one physical network for hundreds of industries
   C. Has an improved spectral efficiency
   D. Has massive energy consumption

10. eNB stands for:

    A. enhanced NodeB
    B. evolved NodeB
    C. enhanced Narrow Band
    D. evolved Narrow Band

11. Which of the following service(s) is(are) provided by the 5G core network?

    A. Control and user plane separation
    B. Mobile edge computing
    C. Network slicing
    D. All of them

12. Which of the following technology(ies) is(are) supported by the 5G New Radio?

    A. Half duplex
    B. CDMA
    C. Both of them
    D. None of them

13. Which of the following multiplexing technologies does massive MIMO use?

A. Spatial
B. Time
C. Code
D. Frequency

14. One of the following is not true about the 5G frequency bands:

A. C-band is mainly used for capacity expansion
B. 5G can use bands above 6 GHz
C. 28 GHz band can be used for industrial purposes
D. Visible light bands are supported

15. One of the following is not true about the sub-6 GHz, it is used for:

A. Higher bit rate
B. Coverage
C. Mobility
D. Connectivity

16. Which of the following is not true about 5G full spectrum?

A. Sub-6 GHz low frequency bands serve as the core spectrum
B. High frequency bands are supplementary
C. Sub-6 GHz is used for higher rate
D. C-band is mainly used for capacity expansion

17. eMBB stands for:

A. Enhanced Mobile BroadBand
B. Evolved Mobile BroadBand
C. Electronic Mobile BroadBand
D. Enhanced Mobile BaseBand

18. Which one of the following is not a reality-based technology?

A. Virtual Reality
B. Augmented Reality
C. Supported Reality
D. Mixed Reality

19. URLLC scenarios require:

A. Ultra-low reliability and ultra-low latency

B. Ultra-high reliability and ultra-low latency

C. Ultra-low reliability and ultra-high latency

D. Ultra-high reliability and ultra-high latency

20. Which of the following 5G application scenario(s) is(are) defined by ITU?

A. eMBB

B. mMTC

C. URLLC

D. All of them

Chapter 7. Huawei IoT Gateways (Industrial + Home)

A. Mark the following <u>True or False</u>?

1. Industrial-grade design requirements include the need of the gateway to be dustproof and waterproof.
2. Enterprise routers temperature range is -40°C to +70°C.
3. Industrial IoT gateway sets in-between the network and the cloud.
4. Industrial IoT gateway includes extensive interfaces and protocols.
5. Industrial IoT gateway uses edge computing to reduce latency.
6. Edge computing reference architecture covers 4 domains: application, data, cloud and device.
7. The reliability of the star topology is high.
8. Huawei RF networking technology is based on the bus topology.
9. Bus topology is simple and easy to expand.
10. Ring topology is easy to expand.
11. The topology of the future home network will be star.
12. A smart home network runs over a baseband connection.
13. AP stands for Access Point.
14. Huawei HiLink allows two connection modes: direct hardware and cloud-based.
15. STB stands for Set Tree Box.
16. Smart home devices can use PLC.
17. Security surveillance is one application of the smart home scenario.
18. Huawei HiLink ecosystem connection includes modules, SDK and routers.
19. HiLink SDK is used to connect the smart home application to the cloud.
20. Wi-Fi, ZigBee, Z-Wave and Bluetooth are examples of wireless communication technologies supported by the smart home gateway.

B. Check the correct answer, there is only one correct answer for each question:

1. Which of the following is not true about industrial-grade routers? they are:

   A. Designed to work in temperature: -40°C to +70°C
   B. Dustproof
   C. Waterproof
   D. Weak against electromagnetic interference

2. Industrial IoT gateways sit in-between:

   A. Network and terminal devices
   B. Network and application
   C. Application and terminal devices
   D. None of them

3. Which of the following is(are) a core-benefit of edge computing?

   A. Real-time services
   B. Data aggregation
   C. Processing at the edge
   D. All of them

4. One of the following is not distributed in the network by edge computing technologies:

   A. Computing
   B. Storage
   C. Coverage
   D. Security

5. How many domains are considered in the edge computing architecture?

   A. 3
   B. 4
   C. 5
   D. 6

6. One of the following is not true about star topology, it is/has:

   A. Easy control
   B. Low cost
   C. Simple structure
   D. Short latency

7. Which of the following is true about the star topology?

   A. Low cost
   B. High reliability
   C. High network latency
   D. Poor resource sharing capability

8. Which of the following is not true about the ring topology?

   A. Closed
   B. Difficult to extend
   C. High reliability
   D. Difficult to locate faulty nodes

9. Which of the following is not true about the bus topology?

   A. Complex structure
   B. Easy to expand
   C. Difficult to locate faulty nodes
   D. Small number of cables are linked

10. Which of the following is not true about the mesh topology?

    A. Rapid deployment
    B. Resilient to damage
    C. Has a control center
    D. No preset infrastructure

11. Which of the following topologies is adopted by Huawei RF technology?

    A. Mesh
    B. Bus
    C. Star
    D. Ring

12. Nowadays, home network topology is:

    A. Star
    B. Mesh
    C. Ring
    D. Bus

13. Which of the following is not true about future IoT home networks? it:

A. Requires accessing broadband connection
B. Uses fiber optics
C. Has a mesh topology
D. Has a low-processing ability

14. Which of the following is not a device used in the IoT home network?

A. STB
B. Smart gateway
C. NodeB
D. Wi-Fi repeater

15. Which of the following technology(ies) can be used to extend Wi-Fi coverage in the IoT home network?

A. PLC
B. Wireless repeater
C. Ethernet AP
D. All of them

16. In the smart ONT solution, which of the following technology is not used inside homes?

A. USB dongle
B. ZigBee
C. Z-Wave
D. LTE

17. In the Huawei smart home solution, the plug-in download service is provided by:

A. The smart terminal devices
B. The open platform
C. The smart gateway
D. Control and management applications

18. Which of the following is not true about Huawei HiLink platform? it is:

A. Open
B. Simple to use
C. Jointly constructed
D. Expensive

19. Which of the following is(are) part(s) of the Huawei HiLink access?

A. HiLink module
B. HiLink SDK
C. HiLink router
D. All of them

20. How many connection modes are supported in the Huawei HiLink solution?

A. 2
B. 3
C. 4
D. 5

Chapter 8. IoT Platform

A. Mark the following <u>True or False</u>?

1. An IoT platform requires device access decoupling, security and reliability.
2. Decimal data are accepted format in Huawei cloud IoT platform.
3. Huawei cloud IoT platform uses LwM2M and MQTT to access devices.
4. Huawei cloud IoT platform is multi-network access, this means devices can connect to the platform directly, through gateways or edge devices.
5. Devices that use property protocols based on TCP/UDP can connect to the IoT platform by using CIGs deployed on the cloud.
6. HTTP is an asynchronous protocol.
7. HTTP is a heavyweight protocol with many headers and rules, thus, it is not suitable for restricted networks.
8. CoAP is based on HTTP.
9. CIG stands for Carrier Interworking Gateway.
10. Device management includes device registration and activation.
11. IoT platform has three ways to deliver commands: Immediate, delayed and synchronic deliveries.
12. In time-based triggers, actions can be set based on specific events.
13. In the IoT platform, firmware and software upgrades for devices are achieved through FOTA and SOTA respectively.
14. In the IoT platform, hardware upgrade is called “Hardware-Over-The-Air”.
15. Huawei cloud uses Identity and Access Management for application registration authentication.
16. Multi-temperature data management maximizes processing efficiency.
17. Multi-temperature management classifies data into two levels: hot and cold.
18. Huawei cloud IoT is access agnostic.
19. The IoT platform has its own security strategies, it includs one for each of the following: device, networking, service, access, data storage and access security.
20. The IoT platform cloud-based architecture is flexible but not scalable.

B. Check the correct answer, there is only one correct answer for each question:

1. One of the following is not a requirement for IoT platform:

   A. Device access decoupling
   B. Coverage
   C. Security
   D. Reliability

2. How many sublayers are there in the functional architecture of the Huawei IoT platform?

   A. 2
   B. 3
   C. 4
   D. 5

3. Which of the following is(are) an accepted data format(s) for Huawei IoT platform?

   A. JSON only
   B. Binary only
   C. None of them
   D. Both of them

4. One of the following is not a category of an IoT device access service:

   A. Device connectivity
   B. Data forwarding
   C. IoT Edge
   D. Application integration

5. One of the following is not true about the IoT device access in the Huawei platform, it supports:

   A. Multiple access modes
   B. Multi-network access
   C. Multi-protocol access
   D. Multiplexing modes

6. If the HTTP client first message has the sequence field set to X, the ACK field in the server response will be set to:

   A. X
   B. X-1
   C. X+1
   D. None of them

7. Which of the following is not true about HTTP? it is:

   A. Stateless
   B. Asynchronous
   C. Heavy weight
   D. Not suitable for restricted network

8. If MQTT is used, how many message(s) is(are) to be exchanged between the client and the server before sending the first publish message?

   A. 1
   B. 2
   C. 3
   D. 4

9. CoAP stands for:

   A. Constrained Access Point
   B. Constrained Application Protocol
   C. Coverage Application Protocol
   D. None of them

10. Which of the following is not a typical IoT protocol?

    A. CoAP
    B. HTTP
    C. MQTT
    D. FBB

11. Devices that do not use TCP/IP protocol stack:

    A. Can not connect the IoT platform
    B. Use a gateway with an integrated IoT device SDK
    C. Use a gateway with an integrated IoT device tiny SDK
    D. None of them

12. IoT device SDK does not support:

    A. C
    B. R
    C. Java
    D. C#

13. Which of the following is(are) used by the IoT platform to deliver commands?

A. Delayed delivery
B. Synchronous delivery
C. None of them
D. Both of them

14. Which of the following is(are) supported trigger(s) in the IoT platform?

A. Time-based
B. Event-based
C. Data-based
D. All of them

15. Which of the following is true about the IoT platform? it supports:

A. Hardware upgrade only
B. Hardware and software upgrades
C. Firmware upgrade only
D. Software and firmware upgrades

16. One of the following is not true about IoT data:

A. Huge volume
B. High quality
C. Low value density
D. High time sensitivity

17. How many data categorizations are included in the Multi-temperature management?

A. 2
B. 3
C. 4
D. 5

18. Which of the following is the correct sequence for managing warm data?

A. Cleansing, storage, analysis, visualization
B. Storage, cleansing, analysis, visualization
C. Analysis, storage, cleansing, visualization
D. Visualization, analysis, storage, cleansing

19. One of the following is not a common IoT data problem:

A. Duplicate data
B. High-quality data
C. Format differences
D. Noise interference

20. Which of the following is(are) character(s) of Huawei cloud IoT platform?

A. Access agnostic
B. Scalable
C. None of them
D. Both of them

Chapter 9. IoT Platform Secondary Development

A. Mark the following <u>True or False</u>?

1. Product development includes product management, model developing and online debugging.
2. The codec is also called “profile”.
3. The profile describes what a device is, what it can do and how to control it.
4. Only data that is matched with the product model is saved on the IoT platform.
5. The codec decodes binary data reported by application into JSON format that can be read by the devices.
6. NB-IoT devices have high requirements on power consumption, that is why their application layer data uses JSON format.
7. Graphical codec development is recommended.
8. GET action is used to create a resource on the server.
9. PUT action is used to update resources on the server.
10. In an API message, path parameter includes the path part in the URL.
11. In an API message, the body parameter is used after the question mark (?) in the URL.
12. Application access authentication is achieved by exchanging messages with the platform's IAM.
13. The status code in the response message of the querying device is 203.
14. Creating a device requires registering it in the cloud first and then binding it.
15. All developments on the device side can be achieved using MQTT and CoAP/LwM2M.
16. IoTDA stands for Internet of Things Data Analytics.
17. Authentication for devices using LwM2M over CoAP is not possible.
18. Authentication for devices is possible using Native MQTT or MQTTS.
19. When deleting a device successfully, the returned code is 204.
20. Querying device messages is achieved using the PUT method.

B. Check the correct answer, there is only one correct answer for each question:

1. Which of the following is not true about the product model?

   A. It is also called "profile"

   B. It defines the properties of a device

   C. It is created using codes

   D. It defines what can a device do

2. A product model includes:

   A. Product details

   B. Service capabilities

   C. None of them

   D. Both of them

3. Which of the following is not done by the codec?

   A. Encodes binary data into JSON format

   B. Decodes data in JSON format into binary data

   C. None of them

   D. Both of them

4. Which of the following is not true about codec development? it is:

   A. Graphical

   B. Written using C++

   C. Offline

   D. Script-based

5. Which of the following can not be performed by application-side API?

   A. View the application access address on the console

   B. Report binary data

   C. Create and manage products

   D. Deliver commands, properties and messages

6. One of the following is not an API action:

   A. ADD
   B. GET
   C. PUT
   D. DELETE

7. Which of the following is not a parameter used in the API messages?

   A. Path
   B. Data
   C. Header
   D. Query

8. Which of the following methods is used by the application access authentication?

   A. POST
   B. GET
   C. PUT
   D. DELETE

9. What is the status code in the response of the application access authentication?

   A. 200
   B. 201
   C. 202
   D. 203

10. PUT Method is used to:

    A. Application access authentication
    B. Querying device messages
    C. Create a device
    D. Modify device information

11. Which of the following device development method is not supported by Huawei cloud IoT?

    A. Certified sensor
    B. Certified module
    C. Certified MCU
    D. LiteOS

12. Which of the following device development methods is supported by Huawei cloud IoT?

A. Certified sensor
B. Certified module
C. Certified MCU
D. LiteOS

13. Common development on the device side requires the use of:

A. Certified MCU and communications module
B. MCU/single-chip microcomputer only
C. MCU/single-chip microcomputer and communications module
D. Certified MCU only

14. Immediate delivery of MQTT device messages is achieved using:

A. IoT device
B. IoT platform
C. IoT application
D. All of them

15. Which of the following is true about device property reporting in JSON format?

A. It requires a codec
B. It does not require a codec
C. It is not possible
D. None of them

16. Which of the following protocol(s) can be used for authentication for devices?

A. Native MQTT
B. LwM2M over CoAP
C. MQTTS
D. All of them

17. When deleting a device successfully, the returned code is:

A. 201
B. 202
C. 203
D. 204

18. In which of the following API operation(s) a token is returned?

A. Application access authentication
B. Device creating
C. None of the them
D. Both of them

19. IAM service is only used when:

A. Creating a device
B. Authenticating application access
C. Deleting a device
D. None of them

20. Which of the following device development method is used if the device includes an SDK Tiny?

A. Certified MCU
B. Gateway
C. Common
D. LiteOS

Chapter 10. IoT OS

A. Mark the following <u>True or False</u>?

1. OS is a computer program that manages hardware, software and firmware resources.
2. DOS and windows are examples of programming language handlers.
3. Peripherals hardware includes external memory, input devices and output devices.
4. Internal memory includes RAM, REM and ROM.
5. CPU stands for Central Programming Unit.
6. Punched tapes are an example of the manual operation system.
7. Multi-job batch processing OS developed to time-sharing OS.
8. Time-sharing OS is an operating system that implements a specific function within a defined time frame.
9. In single-job batch processing OS programs are loaded into the memory and executed individually.
10. Network OS developed after distributed OS.
11. IoT OS can operate in networks where the number of connections might grow up to reach a limit of 10 billions.
12. Open source Huawei LiteOS entered the IoT field in 2015.
13. High requirements on performance and power consumption for videos are two challenges facing the IoT OS.
14. Smart terminals need to meet three standards: smart connections, smart networking and smart management.
15. Huawei LiteOS includes multiple kernels and one middleware.

B. Check the correct answer, there is only one correct answer for each question:

1. The OS manages and controls all resources of:

   A. Software and hardware
   B. Software only
   C. Hardware only
   D. Firmware

2. CPU includes:

   A. Input devices
   B. Output devices
   C. None of them
   D. Both of them

3. One of the following is not a peripherals hardware in the microcomputer system:

   A. CD-ROM
   B. Keyboard
   C. Printer
   D. ROM

4. ALU is included within:

   A. CPU
   B. RAM
   C. ROM
   D. CD-ROM

5. DOS is a(n):

   A. Central processing unit
   B. Operating system
   C. Output device
   D. Main memory

6. One of the following is not an operating system type:

   A. Patch OS
   B. Time-sharing OS
   C. Complex OS
   D. Real-time OS

7. Time-sharing OS developed to:

   A. Real-Time OS
   B. Network OS
   C. Distributed OS
   D. Multi-job OS

8. IoT OS should be able to handle connections up to:

   A. 1 billions
   B. 10 billions
   C. 100 billions
   D. None of them

9. Which of the following hardware technology(ies) is(are) supported by the IoT OS?

   A. DSP
   B. MIPS
   C. FPGA
   D. All of them

10. Which of the following is not a challenge to the IoT terminal development?

    A. Multi-sensor coordination that is complex to manage
    B. High requirements on performance
    C. Power consumption for videos
    D. Various IoT platform

11. How many kernel(s) does Huawei LiteOS includes?

    A. 1
    B. 2
    C. 3
    D. 4

12. Which of the following is true about security in the Huawei LiteOS? it is implemented:

    A. In the kernel layer
    B. In the middleware layer
    C. Across model’s layers
    D. In the open API layer only

13. Huawei LiteOS became open to consumers on:

A. 2010
B. 2011
C. 2012
D. 2013

14. In which year Huawei LiteOS entered the IoT field?

A. 2014
B. 2015
C. 2017
D. 2018

15. Which of the following solution(s) implement Huawei LiteOS?

A. Smart home
B. Smart water meter
C. Smart parking
D. All of them

Chapter 11. Sensing Layer Development

A. Mark the following <u>True or False</u>?

1. All programs process computer data through a simple set of instructions.
2. To implement multiple functions, a register is used.
3. MOV is a common ARM instruction, it is used to transfer data from memory to register.
4. There are two types of instruction sets in today's typical architecture: RISC and CISC.
5. Standard MPUs have a system clock speed of 3 GHz.
6. RAM stores data running in the program, it will disappear after the power goes off.
7. ROM data is lost after the power is off.
8. An interface connects an internal device to an MCU.
9. ADC stands for Analog-to-Digital Converter
10. An interrupt is the process where the CPU stops to execute a new program.
11. In terms of basic sensing functions, there are 5 types of sensing elements.
12. RTD stands for Resistance Temperature Detector.
13. A photoelectric sensor converts electrical signals into optical signals.
14. Huawei LiteOS provides one single memory management algorithm: the static memory allocation.
15. An interrupt can be deleted.
16. The message queue provides an asynchronous processing mechanism.
17. An event is not associated with a task.
18. A semaphore is used only to enable tasks to access system resources synchronously.
19. A mutex is a special binary queue.
20. The system clock is also referred to as time scale or tick.

B. Check the correct answer, there is only one correct answer for each question:

1. Which of the following elements is used to record previous results and subsequent instructions?

   A. Multiplexer
   B. Register
   C. Mux
   D. None of them

2. LDR ARM instructions is used to:

   A. Addition
   B. Subtraction
   C. Data transfer from memory to register
   D. Exclusive OR

3. Standard MPUs have a system clock speed of:

   A. 3 MHz
   B. 300 MHz
   C. 3 GHz
   D. 300 GHz

4. Standard MCUs have a system clock speed that ranges between 10 and 100:

   A. kHz
   B. MHz
   C. GHz
   D. None of them

5. The system bus in the MCU architecture includes:

   A. Control bus
   B. Address bus
   C. Data bus
   D. All of them

6. Under which of the following senses the chemical sensor is classified?

   A. Vision sense
   B. Auditory sense
   C. Taste sense
   D. Olfactory sense

7. In terms of basic sensing functions, which of the following is not a type of senses?

   A. Color
   B. Taste
   C. Touch
   D. Magnet

8. How many classes are used to classify temperature sensors?

   A. 2
   B. 3
   C. 4
   D. 5

9. Which of the following is not a type of heart rate sensor?

   A. Piezoelectric
   B. Photoelectric
   C. Piezoresistive
   D. Photoresistive

10. The process where the CPU stops to execute a new program is called:

    A. Task
    B. Allocation
    C. Interrupt
    D. None of them

11. A task can be:

    A. Created
    B. Deleted
    C. Delayed
    D. All of them

12. One of the following is not a disadvantage of the dynamic memory use:

    A. High performance overheads
    B. Fragments in the memory pool
    C. Memory is wasted if there are many small blocks
    D. Large blocks are cost-effective

13. An interrupt can be:

A. Deleted
B. Delayed
C. None of them
D. All of them

14. Which of the following is not an inter-task communication?

A. Queue
B. Stack
C. Semaphore
D. Mutex

15. Which of the following is not true about events?

A. It is a synchronization inter-task communication
B. It involves data transmission
C. Events are independent from each other.
D. An event is not associated with a task

16. When the number of tasks accessing the same resource reaches the maximum, the semaphore:

A. Blocks other tasks from accessing the resource
B. Release all resources
C. Execute all the tasks
D. All of them

17. How many statuses does the mutex have?

A. 2
B. 3
C. 4
D. 5

18. A mutex is locked when:

A. Two tasks are competing on it
B. A task owns it
C. None of them
D. Both of them

19. Huawei LiteOS provides:

A. Hardware timers
B. Software timers
C. Firmware timers
D. All of them

20. Which of the following is true about Huawei LiteOS kernel features?

A. Low power consumption
B. Strong performance
C. Ultra-small kernel of less than 6 kB
D. All of them

Chapter 12. AT Commands for Communication Modules

A. Mark the following <u>True or False</u>?

1. AT commands are sent from DTE to DCE.
2. After a TE sends an AT command to an MT, the MT sends backs the response.
3. AT commands stands for ATtraction commands.
4. PUT command is a category of AT commands.
5. Execution commands can be written with or without parameters.
6. Set command is used to display valid parameter values set by other AT commands.
7. AT+<x>=P1 is the syntax of a read command.
8. Execution command is used to instruct a module to execute a specific function.
9. AT+<x>=? is the syntax of a read command.
10. AT+<x>=<…> is not a valid syntax of the AT commands.

B. Check the correct answer, there is only one correct answer for each question:

1. AT commands stands for:

   A. ATtention commands
   B. Adapter Terminal commands
   C. Adapter Technical commands
   D. ATtraction commands

2. AT commands are:

   A. Sent from terminal equipment
   B. Sent to a terminal equipment
   C. Sent from a mobile terminal
   D. All of them

3. AT commands are used within:

   A. NB-IoT networks only
   B. Wi-Fi networks only
   C. NB-IoT and Wi-Fi networks
   D. Bluetooth networks only

4. How many categories are there for AT commands?

   A. 2
   B. 3
   C. 4
   D. 5

5. AT command type "=XX" is used to:

   A. Display valid parameter values set by other AT commands
   B. Set the attributes carried in the AT command
   C. Query attributes set by other AT commands
   D. Instruct a module to execute a specific function

6. Read command is referred to as:

   A. "=XX"
   B. "=?"
   C. "?"
   D. Null

7. AT execution command is used to:

   A. Display valid parameter values set by other AT commands
   B. Set the attributes carried in the AT command
   C. Query attributes set by other AT commands
   D. Instruct a module to execute a specific function

8. Which of the following AT commands can be used with and without parameters?

   A. Set
   B. Test
   C. Read
   D. Execution

9. For which of the following command set the syntax "AT+<x>=?" is used?

   A. Set
   B. Test
   C. Read
   D. Execution

10. "AT+CGSN" is an example for a :

    A. Set command
    B. Test command
    C. Execution command with parameters
    D. Execution command without parameters

Correct Answers

Chapter 1. IoT development history and Overview

A. True or False questions

1. False	2. True	3. False	4. True	5. False
6. True	7. True	8. False	9. True	10. False
11. True	12. False	13. False	14. True	15. True
16. False	17. True	18. False	19. False	20. True

B. Multiple choices questions

1. C	2. A	3. D	4. D	5. D
6. B	7. A	8. D	9. C	10. C
11. A	12. C	13. D	14. B	15. A
16. B	17. C	18. D	19. B	20. D

Chapter 2. IoT Industry Applications and Solutions

A. True or False questions

1. True	2. False	3. True	4. False	5. True
6. True	7. False	8. True	9. False	10. False
11. False	12. True	13. True	14. True	15. False
16. False	17. False	18. False	19. True	20. False

B. Multiple choices questions

1. A	2. D	3. C	4. D	5. A
6. D	7. D	8. B	9. D	10. D
11. C	12. B	13. B	14. D	15. C
16. A	17. B	18. C	19. C	20. C

Chapter 3. IoT Security Technologies

A. True or False questions

1. False	2. False	3. True	4. False	5. False
6. True	7. True	8. False	9. True	10. False
11. True	12. False	13. False	14. True	15. False
16. True	17. False	18. True	19. True	20. True

B. Multiple choices questions

1. B	2. D	3. C	4. A	5. D
6. B	7. C	8. D	9. A	10. D
11. B	12. C	13. C	14. A	15. C
16. B	17. B	18. C	19. B	20. A

Chapter 4. Overview of common IoT communication Technologies

A. True or False questions

1. False	2. True	3. True	4. True	5. False
6. False	7. True	8. False	9. False	10. True
11. True	12. True	13. False	14. True	15. False
16. False	17. False	18. True	19. True	20. False

B. Multiple choices questions

1. B	2. D	3. C	4. D	5. C
6. B	7. A	8. C	9. D	10. A
11. C	12. A	13. B	14. A	15. B
16. A	17. B	18. C	19. B	20. C

Chapter 5. NB-IoT Communication Technologies and Solutions

A. True or False questions

1. True	2. True	3. False	4. True	5. True
6. False	7. False	8. False	9. True	10. True
11. False	12. True	13. False	14. True	15. True
16. True	17. False	18. False	19. True	20. False

B. Multiple choices questions

1. B	2. A	3. B	4. D	5. C
6. B	7. B	8. C	9. D	10. A
11. D	12. C	13. B	14. B	15. C
16. C	17. B	18. D	19. B	20. D

Chapter 6. 5G Communications Technologies and Solutions

A. True or False questions

1. False	2. True	3. True	4. False	5. True
6. False	7. True	8. True	9. False	10. False
11. False	12. False	13. True	14. True	15. False
16. True	17. True	18. False	19. True	20. True

B. Multiple choices questions

1. B	2. D	3. D	4. B	5. C
6. B	7. D	8. C	9. D	10. B
11. D	12. D	13. A	14. D	15. A
16. C	17. A	18. C	19. B	20. D

Chapter 7. Huawei IoT Gateways (Industrial + Home)

A. True or False questions

1. True	2. False	3. False	4. True	5. True
6. False	7. False	8. False	9. True	10. False
11. False	12. False	13. True	14. True	15. False
16. True	17. True	18. True	19. False	20. True

B. Multiple choices questions

1. D	2. A	3. D	4. C	5. B
6. B	7. D	8. C	9. A	10. C
11. A	12. A	13. D	14. C	15. D
16. D	17. B	18. D	19. D	20. A

Chapter 8. IoT Platform

A. True or False questions

1. True	2. False	3. True	4. False	5. True
6. False	7. True	8. True	9. False	10. True
11. False	12. False	13. True	14. False	15. True
16. True	17. False	18. True	19. True	20. False

B. Multiple choices questions

1. C	2. D	3. D	4. C	5. D
6. C	7. B	8. D	9. B	10. D
11. B	12. B	13. A	14. D	15. D
16. B	17. B	18. A	19. B	20. D

Chapter 9. IoT Platform Secondary Development

A. True or False questions

1. True	2. False	3. True	4. True	5. False
6. False	7. True	8. False	9. True	10. True
11. False	12. True	13. False	14. True	15. True
16. False	17. False	18. True	19. True	20. False

B. Multiple choices questions

1. C	2. D	3. C	4. B	5. B
6. A	7. B	8. A	9. B	10. D
11. A	12. A	13. C	14. C	15. B
16. D	17. D	18. A	19. B	20. C

Chapter 10. IoT OS

A. True or False questions

1. False	2. False	3. True	4. False	5. False
6. True	7. True	8. False	9. True	10. False
11. False	12. True	13. True	14. True	15. False

B. Multiple choices questions

1. A	2. C	3. D	4. A	5. B
6. C	7. A	8. C	9. D	10. D
11. A	12. C	13. C	14. B	15. D

Chapter 11. Sensing Layer Development

A. True or False questions

1. True	2. False	3. False	4. True	5. True
6. True	7. False	8. False	9. True	10. True
11. False	12. True	13. False	14. False	15. False
16. True	17. True	18. False	19. False	20. True

B. Multiple choices questions

1. B	2. C	3. C	4. B	5. D
6. C	7. C	8. A	9. D	10. C
11. D	12. D	13. C	14. B	15. B
16. A	17. A	18. B	19. B	20. D

Chapter 12. AT Commands for Communication Modules

A. True or False questions

1. True	2. True	3. False	4. False	5. True
6. False	7. False	8. True	9. False	10. False

B. Multiple choices questions

1. A	2. A	3. C	4. D	5. B
6. C	7. D	8. D	9. B	10. D

Abbriviations

Abbreviation	Full name
	#
3GPP	3rd Generation Partnership Project
	A
AGC	Automated Guided Cart
AGV	Automated Guided Vehicle
AES	Advanced Encryption Standard
ADC	Analog-to-Digital Converter
ADSL	Asymmetric Digital Subscriber Line
AI	Artificial Intelligence
AIoT	Artificial Intelligence and Internet of Things
ALU	Arithmetic and Logic Unit
AMI	Advanced Metering Infrastructure
AP	Access Point
API	Application Programming Interface
APT	Advanced Persistent Threat
AR	Augmented Reality
AT command	ATtention command
	B
BLE	Bluetooth Low Energy
BR	Basic Rate
BRAS	Broadband Remote Access Server
BSC	Base Station Controller
BSS	Basic Service Set
BSD	Berkeley Software Distribution
BSS	Business Support System
BTS	Base Transceiver Station
	C
CA	Certificate Authority

CAN	Controller Area Network
CDMA	Code-Division Multiple Access
CIG	Cloud Interworking Gateway
CISC	Complex Instruction Set Computer
CoAP	Constrained Application Protocol
CPE	Customer-Premises Equipment
CPU	Central Processing Unit
CRM	Customer Relationship Management
CSMA/CD	Carrier Sense Multiple Access with Collision Detection

D

DAC	Digital-to-Analog Converter
DC	Data Center
DCE	Data Circuit Equipment
DDoS	Distributed Denial-of-service
DICE	Device Identifier Composition Engine
DIS	Data Ingestion Service
DMS	Distributed Message Service
DOS	Disk Operation System
DRIS	Digital Road Infrastructure Solution
DRX	Discontinuous Reception
DSL	Digital Subscriber Line
DSP	Digital Signal Processor
DTE	Data Terminal Equipment
DTLS	Datagram Transport Layer Security

E

E2E	End-To-End
ECC	Edge Computing Consortium
ECU	Electronic Control Unit
EDR	Enhanced Data Rate
eDRX	extended Discontinuous Reception
EIA	Electronic Industries Association

eMBB	enhanced Mobile BroadBand
eMTC	Enhanced Machine Type Communication
eNB	evolved NodeB
EPC	Electronic Power Control Evolved Packet Core
EPP	Enhanced Parallel Port
ESS	Extended Service Set
ETSI	European Telecommunications Standards Institute
E-UTRAN	Evolved Universal Terrestrial Radio Access Network

F

FAN	Field Area Network
FBB	Fixed BroadBand
FDMA	Frequency Division Multiple Access
FE	Fast Ethernet
FOTA	Firmware-On-The-Air
FPGA	Field-Programmable Gate Array
FSK	Frequency Shift Keying
FTTB	Fiber-To-The-Building
FTTH	Fiber-To-The-Home
FTTN	Fiber-To-The-Neighborhood
FTTx	Fiber-To-The-x
FWA	Fixed Wireless Access

G

GDPR	General Data Protection Regulation
GE	Gigabit Ethernet
GFW	Great FireWall
GMSC	Gateway Mobile service Switching Center
gNB	next generation NodeB
GPRS	General Packet Radio Service
GPS	Global Positioning System
GSM	Global System for Mobile Communications

H

HUD	Head-Up Display
HTTP	HyperText Transfer Protocol
HTTPS	HyperText Transfer Protocol Secure

I

IAM	Identity and Access Management
ICT	Information and Communication Technology
IEEE	Institute of Electrical and Electronics Engineers
IEF	Intelligent EdgeFabric
IETF	Internet Engineering Task Force
IDE	Integrated Development Environment
IMEI	International Mobile Equipment Identity
IMSI	International Mobile Subscriber Identity
Internet	Interconnected networks
IoT	Internet of Things
IoTDA	Internet of Things Device Access
IoV	Internet of Vehicles
IP	Internet Protocol
IPv4	Internet Protocol version 4
IPv6	Internet Protocol version 6
ISM	Industrial, Scientific and Medical
ISO	International Organization for Standardization
ITS	Intelligent Transportation System
ITU	International Telecommunication Union
ITU-R	International Telecommunication Union - Radiocommunication Sector
IVI	In-Vehicle Infotainment
I/O	Input/Output

J

JVM	Java Virtual Machine

L

LAN	Local Area Network
LiFi	Light Fidelity
LoRa	Long Range
LPWA	Low-Power Wide-Area
LTE	Long Term Evolution
LwIP	Lightweight Internet Protocol
LwM2M	Lightweight Machine-To-Machine

M

M2M	Machine-To-Machine
MAC	Media Access Controller
MBus	Meter Bus
MCU	Microcontroller Unit
MCL	Maximum Coupling Loss
MDM	Metering Data Management
MEC	Mobile Edge Computing
MIMO	Multi-Input Multi-Output
MIPS	Microprocessor without Interlocked Pipelined Stages
M-MIMO	Massive Multi-Input Multi-Output
mMTC	Massive Machine-Type Communications
MQTT	Message Queuing Telemetry Transport
MPU	MicroProcessor Unit
MR	Mixed Reality
MRS	MapReduce Service
MSA	Multi-Streaming Aggregation
MSC	Mobile service Switching Center
MT	Mobile Terminal
MU-MIMO	Multi-User Multi-Input Multi-Output

N

NAN	Neighbourhood Area Network
NB-IoT	NarrowBand Internet of Things

NB-OFDM	Narrowband Orthogonal Frequency Division Multiplexing
NFC	Near-Field Communication
NFV	Network Function Virtualization
NGC	Next Generation Core
NR	New Radio
NMS	Network Management System
NSA	Non-StandAlone

O

O2O	Online-To-Offline
OBD	On-Board Diagnostics
OBS	OBject storage Service
OEM	Original Equipment Manufacturer
OFDMA	Orthogonal Frequency Division Multiple Access
OICT	Operational, Information, and Communications Technologies
OLT	Optical Line Terminal
ONT	Optical Network Terminals
OS	Operating System
OSGi	Open Services Gateway initiative
OSI	Open Systems Interconnection
OSS	Operations Support System
OTA	Over-The-Air
OTN	Optical Transmission Network
OTT	Over-The-Top
O&M	Operations & Management

P

PAN	Personal Area Network
PCB	Printed Circuit Board
PDC	Personal Digital Cellular
PLC	Power Line Communication
PKI	Public Key Infrastructure
PMU	Power Monitoring Unit

PSM	Power Saving Mode
PTW	Paging Time Window
	Q
QoS	Quality of Service
	R
RAM	Random Access Memory
RF	Radio Frequency
RFID	Radio-Frequency IDentification
RISC	Reduced Instruction Set Computer
ROM	Read-Only Memory
RR	Round-Robin
RRU	Remote Radio Unit
RSU	Road-Side Unit
RTD	Resistance Temperature Detector
RTOS	Real Time Operating System
RTU	Remote Terminal Unit
	S
SA	StandAlone
SC-FDMA	Single-Carrier Frequency-Division Multiple Access
SDK	Software Development Kit
SDMA	Space Division Multiple Access
SDN	Software-Defined Networking
SHA	Secure Hash Algorithm
SHF	Super High Frequency
SIM	Subscriber Identity Module
SMS	Short Message Service
SNMP	Simple Network Management Protocol
SOAP	Simple Object Access Protocol
SoC	System-on-a-Chip
SOTA	Software On The Air
SRAM	Static Random Access Memory

STB	Set Top Box
	T
TA	Terminal Adapter
TCP	Transmission Control Protocol
TCM	Trusted Cryptography Module
TDMA	Time Division Multiple Access
TE	Terminal Equipment
TLS	Transport Layer Security
TLSF	Two-Level Segregated Fit
TPM	Trusted Platform Module
TTM	Time-To-Market
	U
UART	Universal Asynchronous Receiver-Transmitter
UBI	Usage-Based Insurance
UDP	User Datagram Protocol
UE	User Equipment
UHD	Ultra-High Definition
UHF	Ultra-High Frequency
UMTS	Universal Mobile Telecommunications System
UNB	Ultra-Narrow Band
URLLC	Ultra-Reliable Low-Latency Communication
USB	Universal Serial Bus
	V
V2I	Vehicle-To-Infrastructure
V2N	Vehicle-To-Network
V2P	Vehicle-To-Pedestrian
V2V	Vehicle-To-Vehicle
V2X	Vehicle-To-Everything
VM	Virtual Machine
VR	Virtual Reality
VRP	Versatile Routing Platform

W

WAN	Wide Area Network
WLAN	Wireless Local Area Network

X

XG	X Generation

About the Author

Michel Bakni received the B.S. degree in telecommunication and electronics from Tishreen University, Lattakia, in 2013 and the M.S. degree from UTBM, France, in 2017, in mobile and distributed networks. In 2021, He received a Ph.D. degree in electronics from the doctoral school of the University of Bordeaux (UBx). His research interests include networking, wireless sensor networks, and energy consumption optimization.