

Exam Correction

Q1: Select the correct answer(s)? (4 points)

<p>What is the role of an RFID tag?</p> <p>a) Converts electrical energy into mechanical movement. b) Responds to a radio signal by transmitting information ✓ c) Converts physical information into an electrical signal.</p>	<p>Which of the following is not an IoT component?</p> <p>a) Smart Meter b) Gateway c) Router ✓ d) Cloud</p>
<p>The ITU reference model provides a layered architecture that does not include:</p> <p>a) Business Layer ✓ b) Service Support and Application Support Layer c) Network Layer d) Device Layer</p>	<p>Which network technology typically support both adhoc and infrastructure wireless modes?</p> <p>a) WiFi ✓ b) Bluetooth c) LoRa ✓</p>
<p>Cloud and Fog Computing are essential for:</p> <p>a) Big data analytics ✓ b) Data collection c) Network access monitoring</p>	<p>Which protocol stack does not support IP addresses?</p> <p>a) IEEE 802.15.4 b) LoRA and LoRAWAN ✓ c) Bluetooth d) ZigBee IP</p>
<p>Which of the following challenges does not face IoT simulations?</p> <p>a) Security b) Energy Consumption c) Heterogeneity d) Scalability</p>	<p>Which of the following enabling technologies is not important for IoT?</p> <p>a) Sensors and Actuators b) Connectivity Technologies c) Big Data Analytics d) Identification Technology</p>

Q2: From the list below, specify the technologies that enable the 'Smart City' IoT application? (2 points)

RFID, IP, Smart Meter, Motion Detector, Bluetooth Beacon, Wind Detector, UAV, LoRa, Zigbee, Fog Computing, Decision Tree.

- **Sensors and Actuators:** Motion Detector, Smart Meter
- **Connectivity Technologies:** LoRa, Zigbee, Bluetooth Beacon
- **Big Data Analytics:** Fog Computing, Decision Tree
- **Identification Technology:** RFID

Q3: Answer the following questions? (5 points)

1) Cite the layers of the most basic IoT architecture?

The most widely recognized model for IoT is the three-layer architecture. It is composed of the Perception Layer, the Network Layer, and the Application Layer

2) What are the categories of IoT wireless networks ?

Long-range networks, Medium-range networks, Short-range networks

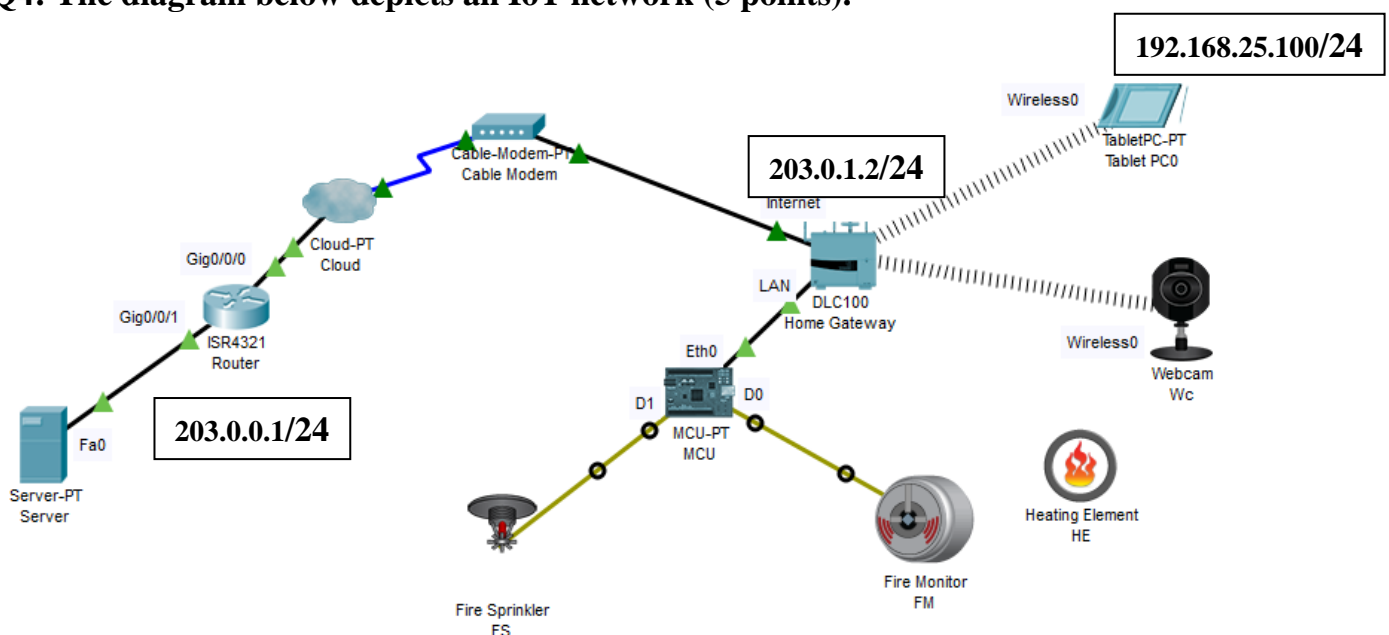
3) Compare, in table, between Lora/LoraWan and IEEE802.4?

LoRa/LoRaWAN	IEEE 802.4
star-of-stars topology	star, peer-to-peer, or mesh topologies
LoRaWAN MAC employs ALOHA	slotted CSMA/CA
LoRa's CSS-based modulation	(DSSS) modulation
long distances (several kilometers)	short-range communication
does not natively support IP-based communication.	support IP-based communication
Class A, Class B , Class C (End Devices)	Fully Functional Devices (FFDs) and Reduced Function Devices (RFDS) devices
used in LPWAN networks	low-rate wireless personal area networks (LR-WPAN).

4) Explain the functioning principal of 6LoWPAN Architecture?

The 6LoWPAN architecture consists of multiple types of WPANs (Low-Power Wireless Area Networks), which function as access stub networks without transmitting traffic to other networks. There are three types of WPANs in the 6LoWPAN architecture: Simple WPANs, Ad hoc WPANs, and Extended WPANs. These LoWPANs are connected to other IP networks through Edge Routers, which act as traditional IoT gateways between the access and core networks.

Q4: The diagram below depicts an IoT network (5 points).



From the Figure,

1) Indicate the network components and the IoT components?

network components: Router, cable modem

IoT components: Server, cloud, HG, Tablet, Wc, HE, FM, MCU, FS

2) Complete the following table

Device	Server	Router		Home Gateway		MCU	TbletPC	Webcam
NIC IP @	203.0.0.2	203.0.0.1	203.0.1.1	203.0.1.2	192.168.25.1	192.168.25.102	192.168.25.101	192.168.25.100
Subnet M	255.255.255.0	255.255.255.0	255.255.255.0	255.255.255.0	255.255.255.0	255.255.255.0	255.255.255.0	255.255.255.0
Default Gat	203.0.0.1			203.0.1.1		192.168.25.1	192.168.25.1	192.168.25.1

3) Write the code python of MCU to simulate the fire detection event: **main.py** (see TP)

```
from gpio import *
from time import *

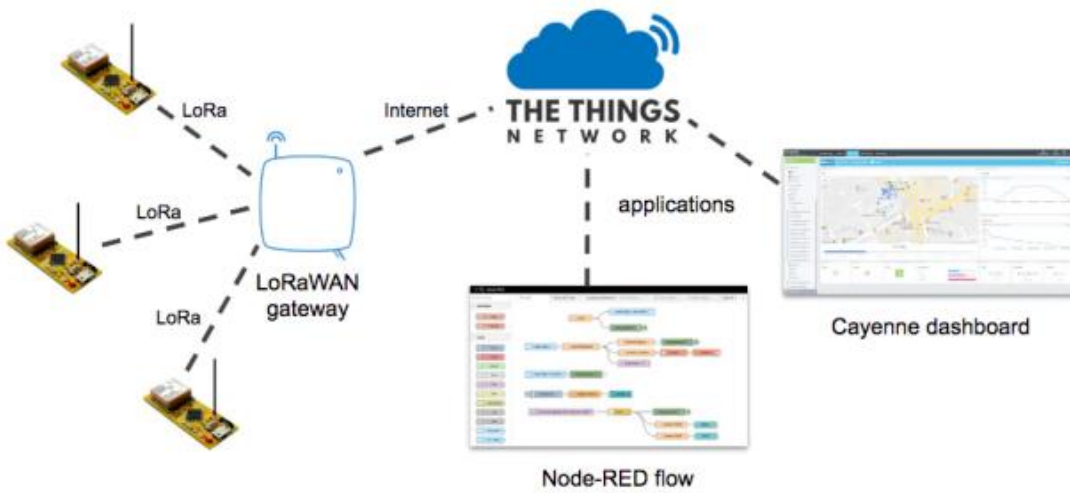
def main():
    pinMode(0, INPUT)
    pinMode(1, OUT)
    print("Fire Alarm System")
    while True:
        fire = digitalRead(0);
        print(fire);
        if(fire==1023):
            customWrite(1,'1');
        else:
            customWrite(1,'0');

if __name__ == "__main__":
    main()
```

Q5: Use case (4 points)

A startup plans to deploy an **IoT ecosystem for Smart Agriculture** using **low-power, long-range communication technology**. **Sensors** in the fields automatically send data to a **supervision center** several times a day. The data is transmitted in three steps: from **the sensors to a nearby gateway** (located within 15 km of the gateway), then to an **internet server** (TTN), and finally, to an **application server** (Node-Red) that stores and displays the data on a dashboard for the supervision center.

1. What is the technology suitable for this purpose? **protocole LoRaWAN**
2. Draw the general architecture for this ecosystem.



3. Provide the protocol stack for each component of this architecture.

