True or False:
NB-IoT enhances device battery life compared to LoRaWAN and SigFox.
a. True
b. False

True or False:
The terms “serverless” and “Function-as-a-Service (FaaS)” refer essentially to the same cloud model.
a. True
b. False

True or False:
Within federated learning, submission of data by end-devices in a timely manner (often referred to as timeliness) is not an issue.
a. True
b. False

True or False:
A great advantage of Software-as-a-Service is that it can be always be customized to one's needs.
a. True
b. False

True or False:
Within federated machine learning, some private information may be inferred even if devices do not transmit the actual data.
a. True
b. False

True or False:
According to the ETSI standard specifications for Multi-access Edge Computing, when a customer selects to create an application instance via a Customer Facing Service portal, the application package should have already been onboarded.
a. True
b. False

True or False:
Each container running on a physical host has its dedicated device drivers.
a. True
b. False

True or False:
Software-as-a-Service and Platform-as-a-Service are worse in terms of vendor lock-in than Infrastructure-as-a-Service.
a. True
b. False

True or False:
With services computing, loose coupling indicates the degree of dependency. Web services are loosely coupled.
a. True

b. False

True or False:
Cloud computing is beneficial when considering the use case of batch computational workloads.
a. True
b. False

True or False:
It is more typical to execute a microservice in a virtual machine than in a container.
a. True
b. False

True or False:
When network neutrality is not enforced, IoT service providers can team up with network operators so that their services' traffic is preferentially treated.
a. True
b. False

True or False:
LPWAN offers connectivity with higher throughput compared to WAN. Wi-Fi is an example of an LPWAN technology.
a. True
b. False

Single-Choice:
An IoT application is in charge of continuously collecting data from thousands of environmental sensors distributed over a country, performing some initial filtering of the data to detect faulty sensor readings, and storing them for future processing. Where would you host the data filtering functionality?
a. On the cloud
b. At the edge

Single-Choice:
A cancer research institute provides services of DNA (genome) analysis for patients of nearby hospitals. This requires running a genome sequencing analysis on each of the samples independently. Assume that each individual sample analysis can be handled by a single large-memory Amazon EC2 VM instance. The institute’s primary concern is to serve requests for DNA analysis as fast as possible, to return results to hospitals it serves. Based on the provided information, which EC2 instance type would you use to implement the described use-case? Select the one that is most applicable.
a. Dedicated
b. Reserved
c. On-demand
d. Spot instance

Single-Choice:
Consider an application where IoT devices are equipped with sensors and cameras. When the sensor of the device senses an event, its camera captures a high-definition image and sends it over the network to a server for processing. Sensing events take place with a frequency of 20 per minute on

average, and the size of each transmitted image is 10 MB. Which of the following networking technologies is more appropriate to connect an IoT device?
a. LoRaWAN
b. NB-IoT
c. Wi-Fi

Single-Choice:
Consider a cloud provider that offers Function-as-a-Service, where every function is executed in isolation within a Docker container. For a given function, the docker container is deleted if the function has not been invoked for 300 seconds and is re-launched upon the next function invocation. Consider also the following applications.

Application A: An IoT device senses a temperature value periodically every 10 minutes and sends this value to a cloud application instance. When the application instance receives it, a serverless function is triggered that performs a sanity check on the temperature value and stores it in a cloud-based key-value store. Assume that each IoT device belongs to a single cloud tenant, who has deployed a dedicated cloud application instance and a dedicated serverless function to serve the requests of this specific IoT device.

Application B: A camera placed at a traffic light takes a photo of the license plate of every car that crosses it when the traffic light is green, and uploads it to a cloud application. When a photo is received by the application, a serverless function is triggered that scans the license plate number and stores it in a database. The traffic light follows a cycle of 40 seconds for the green signal and 20 seconds for the red one. During the least busy hours, at least two cars cross the traffic light when it is green. Which application is expected to face more cold-start latencies?
a. Application A
b. Application B

Calculation:
Assume a scenario where 3 mobile devices participate in a federated learning task. Before a given training round, the server selects a subset of these devices, which will then perform training on their local data and submit model updates to the server. It is possible that a selected device fails to submit a report at the end of the round (e.g., it may run out of battery during the process, lose its connectivity, etc.). For each device, the probability that it successfully delivers its report in a round is given below:
Device 1: $p1 = 0.1$
Device 2: $p2 = 0.6$
Device 3: $p3 = 0.4$

At the same time, each device has a fixed cost to participate in a round. If selected, the cost of each device is given below:
Device 1: $c1 = 10$
Device 2: $c2 = 2$
Device 3: $c3 = 20$

The server needs to select the subset of devices to participate in the round which minimizes the total cost, under the constraint that the expected number of reports that will be received by the server is at least $E = 1$. (The total cost is defined as the sum of the costs of all devices that participate in a round. If a device is not selected, it does not contribute to the overall cost.)

(a) What is the optimal subset of devices that the server should select? Provide your answer in the following format: (X,Y,...). For example, if the server selects devices 1 and 3, your answer should be (1,3), if the server selects device 2 your answer should be (2), etc. If there is no feasible solution, your answer should be (). This format is strict: Do not use whitespace characters in your answer; keep the paretheses.

(b) What is the cost of the optimal solution? Provide a numerical value. If there is no feasible solution, answer with 0.

(c) What is the expected number of reports that the server will receive in this round under the optimal solution? Provide a numerical value. If there is no feasible solution, answer with 0.