1. Answer the following questions regarding the concept of Cloud Computing:

(a) Explain the concept of cloud computing with your own words based on the definition in the source paper.
Cloud computing refers to the practice of employing a network of remote servers hosted on the internet for storage, management, and data processing rather than on a local server or personal computer. Cloud computing can be deployed over the cloud, on-premises, or hybrid deployment.

(b) Considering the example applications in the paper, briefly discuss the reasons of using cloud computing in aquaculture and its relation to supply chain.

The adoption of cloud computing for aquaculture from traditional labour-intensive farming to mechanized aquaculture and slowly to automated systems (Li & Li 2020).
These systems can fix defective performance issues and inadequate information in understanding large and diverse big data in aquaculture to achieve smart data processing and analysis and enhance decision-making in intelligent aquaculture (Yang et al. 2020b). With relation to supply chain a full end to end picture can be viewed and adjusted in the modernization of a digital supply chain to meet unexpected changes in environment as well as to adjust for demand during a disease breakout.

(c) Briefly discuss the service models of cloud computing with examples for each of them. Explain the customers role in each service model.

Example: three main service models which represent different parts of the cloud computing components;
Software as a Service (SaaS) designed for customers, ordering, and order status
Platform as a service (PaaS); designed for developers help push out new iterations of webcontent and application development, business logic and
Infrastructure as a Service (IaaS); designed for system administrator (AWS), services provided here will allow for vertical/horizontal resource expansion to meet the demand for unforseen website traffic, as well as helping to downsize resources when resources are not needed. Customer has full control over the environment.

(d) What are the deployment models that are used in cloud computing in the source paper?

Public Cloud, Private Cloud, Hybrid Cloud, Community Cloud and Edge Cloud.

2. Answer the following questions considering the security aspect of Cloud Computing:

(a) How could Cloud Computing, IoT and Artificial Intelligence (CIA) ensure the traceability and reliability in aquaculture supply chain?
The reliability and traceability can be verified using BlockChain, the design of blockchain is to provide those exact use cases. Since each cloud computing model adds its own entries to the blockchain, the entire supply chain can be used to extract component level data and since the data is immutable, the reliability is built in.

(b) What security risks are there for health and how traceability in cloud computing would help to reduce or prevent that risk?

Fish health can be compromised by equipment failure, data tampering, feed contamination by humans actors. To help reduce the risk, sensor readings, feed batch, animal ID, and equipment adjustments can be monitored by the cloud ledger (block chain data). The blockchain is a tamper proof audit trail.

(c) How would a data be protected against data leaks in the cloud?

Data leaks can be lessened by encrypting data at rest, in transit, and using an enforcement of least privileged access to authenticated users and services. Continuous monitoring and automation of Data loss Prevention workflows with AI to detect and flag anomalies as wells as data ex-filtration attempts. Regular security audits, mixed with penetration testing, reviewing audit logs will help in detecting, containing and investigations of security events.

(d) Considering fully digitalized supply chain, what kind of human errors could occur? How would you prevent a security risk in a case where a user lost their access information? Briefly discuss.

Human errors could occur with improper configuration of permissions, deletion of metadata, improper sharing of credentials, as well as sharing or exposing sensitive data on a public discussions, forums, websites. To prevent these risks, Id enforce user based role permissions, least privileged access, and multi-factor authentication. Continuous audit logging and monitoring will help with user abuse of data, as well detect breaches and remediation of those breaches.

(e) Discuss the internet security risk of cloud computing in aquaculture. How would decentralization effect the decision makers?

The risk of cloud services is the exposure of sensitive data, feeding schedules, water-quality metrics, breeding records as described with vendor dashboards that are publicly available. A decentralized system would spread the risks across multiple locations, (jurisdictions) which would reduce the impact of a single compromise to the primary sight, or the central site. A decentralized approach would enhance resilience and data sovereignty.

3. Answer the following questions regarding the application of Cloud Computing in digitization of the aquaculture industry:

(a) If you would be the manager of mid-size aquaculture supply chain, would you choose on-premise or cloud computing? Explain the reasons.
A hybrid cloud computing would be the best option, as it reduces risk and increases resilience of data and services for the supply chain infrastructure. Also reduces the cost of hardware, infrastructure for a mid-sized company, and being hybrid, I would still be able to maintain or SILO my data within my own site.

(b) Discuss the challenges of deploying cloud computing in aquaculture supply chain?
First challenge would be having all devices be internet connected. Some locations (physical locations) might not have a internet provider available, or the use use of many internet providers would be an issue as well as differing services would have a range of bandwidth available per location, other consideration would be does the service guarantee a services level above 99.999% or less. In case of power outages at site X who would maintain the site, and be available to fix issues. There would be a technical skills gap, the local farmers might not have the technical expertise to run the cloud services, digital equipment or understand how to fix and issue.

(c) Consider a fully integrated supply chain from fishery farm to a retail store that includes, fish foods, reproduction, transportation, containment, storage. Explain what kind of information would you collect at each stage to inform next chain and end-customers?

Fish food data would include in stock items, on order items,
Reproduction, could include – breed, fish id, fish survival rate, breeding success rate, genetic profile.
Transportation – details on delivery date, gross weight, refrigeration levels, humidity, gps data-driven
Contamination – batch number, barcodes/ QR, seal integrity testing, packaging type (vac seal, plastic wrap etc), type of pathogen screening.
Storage – inventory count, humidity, temperature, shelf life, shelf storage length.

(d) What kind of information could be provided to end-customer by using cloud computing?

Fish health, growth population, water quality climate and pollution level, as well as any lab tests, pathogen screening. Customer could also get data regarding exact farm, species, breeding lineage, and even feed history. Other data could be real time temperatures from farm to shelf.

(e) What kind of information could be provided in order to ensure good condition of products during the transportation by using cloud computing?

Some metrics could be provided such as: continuous temperature, humidity, and light levels streamed from onboard sensors to the cloud, with threshold-based alerts if any parameter exceeds safe limits. GPS data to ensure product delivery is at its most optimal to ensure the highest level of freshness. Accelerometer data could be used to determine if any fish was damaged due to sudden stops or large bumps in the road(s).