Q-1: Consider a situation where you have developed an app called, "Corona Guide", a mobile application, which relies on an external API service to provide real-time data on COVID-19 cases, including counts of infections and deaths. The application's functionality heavily depends on the consistency of the API's request and response structure. However, due to a sudden change in the API's request and response body, the application experienced a significant disruption, resulting in crashes and unexpected errors. Given this scenario, how could the server-side management of the API have been handled more effectively to prevent such issues on the client side when a sudden change occurred? Please mention strategies & best practices to address this challenge.

Q-2:

Imagine a scenario in which a client in Bangladesh needs to integrate the services of "Onnorokom," an SMS service provider. Onnorokom supports X and Y for integration purposes, but there is a requirement from the client to use Z, which is not supported by Onnorokom. Please note that In this situation, the client is unable to request Onnorokom to create a library for Z, and using an SDK is not an option also.

Given the constraints mentioned in the scenario, how can the client effectively use Z for integrating with the Onnorokom SMS service? Are there alternative approaches or techniques that the client can employ to achieve this integration while adhering to their requirement of using Z without requesting a new library or using an SDK?

Here, X, Y & Z are languages or frameworks.

Q-3:

Suppose you are tasked with implementing a new feature for GitHub that allows users to perform pull and push actions using a simple REST API. This feature would enable developers to fetch code changes (pull) and update code repositories (push) without relying on GitHub's web interface or Git command-line tools.

How can you implement this GitHub pull-push feature using a simple REST API, and what approach can be used to track changes in content, ensuring the server can easily compare these changes?

Q-4:

The University Grants Commission (UGC) is on a mission to gather financial transaction data for public universities to promote transparency. To achieve this goal, UGC has developed a system that aims to collect data from universities. UGC intends to create a module/SDK/library that the universities are required to use to share their financial data. However, some universities already have systems in place with exposed APIs in their intra-network systems, but they are reluctant to share their request-response data/structure with UGC. UGC needs access to these APIs to meet its objectives.

In light of this situation, how would you propose a solution for UGC to access the universities' data without requiring knowledge of their request-response data/structure? Please provide a flowchart illustrating your proposed solution.

Q-5: Your company is developing an application with rapidly changing requirements. The dynamic nature of these changes makes it challenging for manual testers to keep up with the testing demands. In response, the company asks you to design automated testing

scripts to efficiently handle these frequent requirement changes, particularly in the context of an application that exposes numerous APIs. How would you approach the task of designing automated testing scripts for an application with evolving requirements and a substantial number of exposed APIs? Please outline your methodology and key steps to ensure that your automated testing solution is adaptable to changes.

Q-6: Your team is developing a multi-tenant coaching center application, where different coaching centers will utilize the platform. Each coaching center can create exams, and these exams are accessible via unique URLs. For instance, Coaching Center X creates an exam with ID 1, which can be accessed through the URL coachingX.com/exam/1. However, there is a concern that someone like Coaching Center Y could potentially access Coaching Center X's exams using the URL. You need to implement a robust resource authorization system to prevent unauthorized access. How would you approach and implement a resource authorization system for your multi-tenant coaching center app to ensure that only authorized coaching centers and their associated students can access specific exams? Please describe briefly.

Q-7: Scenario 1: The Rise of AppX

In Scenario 1, a talented group of developers created a mobile app called "AppX." It started with just 50 users but quickly gained popularity, attracting thousands of users. With the surge in user numbers, the app began to experience performance issues, including increased response times and delays, affecting user experience.

Scenario 2: Railway Ticketing Woes

In Scenario 2, a railway ticketing system in a nearby city faced challenges during peak hours. It became slow and almost inaccessible, resulting in frustrated passengers. The railway system was struggling to cope with high demand, leading to performance problems during peak periods.

Scenario 3: The Global Football Fantasy Game

In Scenario 3, the developers of AppX created a global football fantasy game. This game relied on third-party data for real-time updates and involved intensive computational tasks for scoring goals, saves, and other in-game actions. It required rapid data updates and real-time responses, much like the growing needs of AppX.

The three scenarios are interconnected by a common challenge: handling thousands of concurrent users, reducing response times, and managing intensive computational tasks. In each scenario, performance problems arose due to rapid user growth and data updates, emphasizing the need for a unified solution.

In situations where you cannot significantly increase hardware capabilities, what unified strategies and technologies would you propose to provide services for thousands of concurrent users, reduce response times, and manage intensive computational tasks, especially where data updates per second play a crucial role? Remember that these challenges become even more critical in the context of a global user base, such as the one in the fantasy game scenario.

Q-8:

Imagine you are working for a rapidly growing e-commerce platform that wants to enhance the security and user experience of its online marketplace. The platform needs an API for user authentication and authorization to ensure that only authorized users can access certain features and resources. Additionally, they aim to provide a registration and login process for their expanding user base.

In the context of the e-commerce platform described in the scenario, create a comprehensive diagram that illustrates how user registration, login, and access control will work within the system.

Q-9:

Assume you are part of a team working on a weather data service that aims to provide accurate and up-to-date weather information to a variety of clients, including weather applications, websites, and IoT devices. The service needs to collect and manage weather data from various external sources, including weather sensors, weather stations, and third-party weather APIs. Your task is to design an API that can ingest data from these sources and provide it to clients.

Create a detailed diagram that illustrates the flow of data from external sources, such as weather sensors and APIs, to your API. Additionally, depict how clients, which can be weather applications, websites, or IoT devices, can retrieve weather information.

Q-10:

In the dynamic world of IT, the Institute of Information Technology at the University of Dhaka is facing a critical challenge. Our institution's digital infrastructure has outgrown its current setup, and it's time to migrate to a more powerful and scalable environment. This migration is essential to address the strain on the current IT infrastructure, which has become outdated and is limiting the institution's ability to expand, compromising reliability and performance.

Now you've to come up with a plan. How would you create a plan for a smooth server and database migration at the Institute of Information Technology, University of Dhaka, to ensure there are no service disruptions, data loss, or degradation of performance? Explain in detail. Additionally, propose an automated disaster recovery plan with a diagram for the new data center (server).