1. Compare and contrast deploy your applications on cloud computing vs more traditional client-server computing or operating your own data center?

Deploying applications to a cloud platform means that the infrastructure that supports your application is purchased from another organization and managed by them.

What is novel about cloud computing and what are pros and cons?

- Cloud computing removes the responsibility of managing the hardware to support a service environment. The customer pays only for what is needed to support the application (pay-as-you-grow), instead of paying for discrete units of required hardware.
- Cloud services offer options that conduce high scalability via easily constructing and destructing individual hosting systems.
- Cloud environments can be in one of many data centers around the world, and each location can be fortified with fallback mechanisms, increasing availability of the applications deployed.
- Cloud services provide options for fallback and redundancy mechanisms for increased reliability.
- Con: Lack of direct hardware access means increased security risk and issues when attempting to debug errors applications deployed to cloud environments.
- Con: Lack of direct hardware access reduces environment options to those explicitly offered by the cloud service.

2.

    a. If the system is reported to have MTTF 1500 hrs and MTTR 10 mins, please calculate the system availability?

        Availability = MTTF / (MTTF + MTTR)

                = 90000 mins / (90000 mins + 10 mins) = %99.988 (Availability Class 3)

    b. What if your system availability is 4 9's, will your system with current MTTF 1500 hr and MTTR 10 mins, satisfy 4 9's requirement?

        No, the current availability is only in the 3 9's class.

    c. If not so, what will you do, please answer and provide justifications

        I would increase the MTTF by implementing extra fault-tolerance mechanisms like redundant instances, increasing the overall uptime and thus the availability, until the availability falls into class 4.

3. If a system failure rate 2500 hrs (MTTF), repair time (MTTR) 8 hrs. A system maintenance with total shutdown every month for 2.5 hrs each. What is the planned downtime, unplanned downtime, total downtime, and system availability?
Planned downtime: $2.5 * 60 * 12 = 1800$ mins/yr
Unplanned downtime: $(((365 * 24) / 2508) * 8) = 1676.555$ mins/yr
Total downtime: $1800 + 1676.555 = 3476.555$ mins/yr
Availability: $(365 * 24 * 60 - 3476.555) / (365 * 24 * 60) = \%99.33$

4. What is the system modeling and what are the benefits and why is it so important today, esp today software/systems?

System modeling is the process of constructing a simplified representation of a system or phenomenon of interest of a product. It is important for software and tech systems because it allows an architect or developer to recognize potential problems with a system before implementing them and provides high level documentation for the system.

Describe modeling types and their main purposes:
-   Physical Model: Represents hardware components of a distributed system without explicit software or networking components
-   Architectural Model: Describes how components of a system interact with each other as well as some necessary specific details surrounding the environment for each component
-   Fundamental Model:
    -   Interaction Model: specifies synchronization and performance details concerning component intercommunications
    -   Failure Model: Defines types of failures than can occur in a system and how to respond to them
    -   Security Model: Defines potential security risks/threats and how and to what degree they should be address or attended to