Assignment: Module 1 – Overview of IT industry

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Theory exercises:

1. Explain in your own words what a program is and how it functions. What is Programming?

Ans: A program is a set of instructions written in a programming language that tells a computer what to do. It functions by being translated into binary code, which the computer executes step by step to perform tasks like calculations, showing graphics, or handling user input.

2. What are the key steps involved in the programming process?

Ans: Key steps involved in programming process are as follows:
1. Understand the problem – Know what you are trying to solve.
2. Plan the solution – Design logic with pseudocode or flowcharts.
3. Write the code – Use a programming language to implement it.
4. Test it – Run the program and see if it works.
5. Debug – Fix any issues or errors.
6. Deploy – Make it available for others to use.
7. Maintain – Update and improve it over time.

3. What are the main differences between high-level and low-level programming languages?

Ans: The main differences between high-level and low-level programming languages are based on their level of abstraction from machine code and ease of use.

High-level programming languages are closer to human language, making them easier to read, write, and understand. They are designed to be user-friendly and handle many complex tasks like memory management automatically. Examples include Python, Java, and C++.
Low-level programming languages are closer to machine language and provide more control over hardware and system resources. They are faster and more efficient but harder to write and understand. Examples include Assembly language and machine code.

4. Describe the roles of the client and server in web communication.

Ans: In web communication, the client and server play two key roles that enable the exchange of information over the internet.

- The client is usually a web browser or app on a user's device. Its role is to send requests to the server for specific resources, such as web pages, images, or data.
- The server is a powerful computer that stores websites, databases, and other content. Its role is to receive the client's request, process it, and send back the appropriate response or resource.

This exchange happens over protocols like HTTP or HTTPS.

5. Explain the function of the TCP/IP model and its layers.

Ans: The TCP/IP model is a set of communication rules used for sending data over the internet. It breaks down the process into four layers, each with a specific function:

- Application Layer – Handles communication between software (e.g., web browsers, email).
- Transport Layer – Ensures reliable data delivery using protocols like TCP.
- Internet Layer – Handles addressing and routing of data using IP.
- Network Access Layer – Deals with hardware and how data is physically sent.

Together, these layers make sure data is sent, routed, and received correctly across networks.

6. Explain Client-Server Communication.

Ans: Client-server communication is a model where a client (e.g., a web browser) sends requests to a server (a computer or system) for resources like web pages or data. The server processes the request and sends back a response. This interaction typically happens over protocols like HTTP or HTTPS.

7. How does broadband differ from fiber-optic internet?

Ans: Broadband refers to high-speed internet that provides fast data transfer, and it can use various technologies like DSL, cable, or satellite.
Fiber-optic internet is a type of broadband that uses light signals transmitted through fiber-optic cables, offering faster speeds, higher capacity, and more reliability compared to other broadband types like DSL or cable.

8. What are the differences between HTTP and HTTPS protocols?

Ans: HTTP (Hyper Text Transfer Protocol) is used for transmitting web pages over the internet, but it does not encrypt data, making it less secure.

HTTPS (Hyper Text Transfer Protocol Secure) is the secure version of HTTP, using SSL/TLS encryption to protect the data transferred between the client and server, ensuring privacy and security.

9. What is the role of encryption in securing applications?

Ans: Encryption protects sensitive data by converting it into unreadable code, ensuring privacy, integrity, and authentication. Only authorized users can decrypt and access the data, keeping it safe from unauthorized access.

10. What is the difference between system software and application software?

Ans: System Software: Manages and controls the hardware of a computer. It includes the operating system (e.g., Windows, macOS) and utility programs (e.g., antivirus, file management). It helps applications run but isn't directly involved in specific tasks like word processing.
Application Software: Performs specific tasks or functions for the user, such as word processing, web browsing, or gaming. Examples include Microsoft Word, Google Chrome, and Photoshop.

11. What is the significance of modularity in software architecture?

- **Ans:** Modularity in software architecture refers to designing a system as a collection of separate, independent components or modules. Each module encapsulates a specific functionality and can be developed, tested, maintained, and updated independently.
  The significance of modularity includes:
- Improved Maintainability: Changes in one module can be made with minimal impact on others, making the system easier to maintain and update.
- Reusability: Modules can be reused across different projects, reducing development time and effort.
- Scalability: Modular systems can be scaled more easily by adding or upgrading individual modules without overhauling the entire system.
- Enhanced Collaboration: Teams can work on different modules simultaneously, promoting parallel development and faster delivery.
- Easier Testing and Debugging: Isolated modules make it easier to test and debug parts of the system without affecting the whole application.
- Better Code Organization: Modularity helps in organizing code logically, making the architecture cleaner and more understandable.

12. Why are layers important in software architecture?

Ans: Layers are important in software architecture because they organize the system into logical sections, each with specific responsibilities. This layered approach offers several benefits:

- Separation of concerns: Each layer focuses on a particular aspect of the application (e.g., user interface, business logic, data access), making the system easier to understand, maintain, and modify.
- Reusability: Components in a layer can often be reused in different parts of the application or in other projects.
- Scalability and flexibility: Layering makes it easier to scale or replace parts of the system without affecting the entire architecture.
- Maintainability: Isolating functionality into layers helps developers identify and fix bugs or make improvements with minimal impact on other parts of the system.
- Testability: Layers enable targeted testing, such as unit testing for the business logic layer or integration testing for the data layer.

13. Explain the importance of a development environment in software production.

Ans: A development environment is crucial in software production because it provides the tools, settings, and resources developers need to write, test, and debug code efficiently. Its importance includes the following:

- Efficiency and Productivity: A good development environment includes code editors, compilers, debuggers, and version control

systems, all of which help developers work faster and more effectively.

- Consistency: It ensures that all team members work in the same setup, reducing errors caused by differences in individual systems.
- Error Detection and Debugging: Development environments often include features like syntax highlighting, error alerts, and debugging tools that help identify and fix issues early.
- Testing and Simulation: They allow for local testing and simulation of software behavior before deploying to production, minimizing the risk of failures.
- Version Control Integration: Many environments support tools like Git, making it easier to track changes, collaborate, and manage code versions.

14. What is the difference between source code and machine code?

Ans: Source code: Source code is the human-readable code written by programmers using programming languages like Python, Java, or C++. It includes instructions and logic that tell the computer what to do.
machine code: Machine code is the computer-readable version of the source code. It consists of binary digits (0s and 1s)

15. Why is version control important in software development?

Ans: Version control is important because it helps developers manage changes to code over time. Here's why it matters:

- Tracks changes: It keeps a record of who made what change and when.
- Collaboration: Multiple developers can work on the same project without overwriting each other's work.
- Reverts mistakes: You can go back to a previous version if something breaks.
- Branching: Developers can experiment with new features without affecting the main code.
- Improves productivity: Makes project management more organized and efficient.

16. What are the benefits of using Github for students?

Ans: GitHub is a powerful tool for students, especially in tech and computer science fields. It offers version control to track changes in code, and makes collaboration easy for group projects. Students can learn Git, a valuable skill in the industry, and build a public portfolio to showcase their work. GitHub also provides free access to premium tools through the Student Developer Pack. Additionally, it allows students to contribute to open-source projects and safely store their code in the cloud.

17. What are the differences between open-source and proprietary software?

Ans: Open-source software has source code that is freely availsable for anyone to view, modify, and distribute. It is usually free and supported by a community of developers. In contrast, proprietary software is owned by a company or individual, and its source code is kept private. Users must buy a license to use it, and

they cannot modify or share the software. Support and updates for proprietary software are typically provided by the company that developed it.

18. How does GIT improve collaboration in a software development team?

Ans: Git improves collaboration by allowing multiple developers to work on the same project at the same time without overwriting each other's work. It tracks changes through version control, so team members can see who made what changes and when. Git also enables branching, allowing developers to work on new features or bug fixes separately, then merge them into the main project. This makes teamwork more organized, reduces conflicts, and helps manage code efficiently.

19. What is the role of application software in businesses?

Ans: Application software plays a crucial role in businesses by helping to perform specific tasks and improve productivity. It includes programs designed for tasks such as word processing, data management, accounting, customer relationship management (CRM), and communication. These tools allow businesses to automate processes, manage operations efficiently, analyze data for decision-making, and enhance collaboration among employees. Overall, application software supports business goals by streamlining workflows and increasing overall efficiency.

20. What are the main stages of the software development process?

Ans: The main stages of the software development process are:

- Planning – Understanding the project goals, requirements, and feasibility.
- Analysis – Gathering detailed requirements and defining what the software must do.
- Design – Creating the architecture and design of the software, including user interfaces and databases.
- Development (or Implementation) – Writing the actual code to build the software.
- Testing – Checking the software for bugs and ensuring it works as intended.
- Deployment – Releasing the software for users to use.
- Maintenance – Updating the software to fix issues, improve performance, or add features.

21. Why is the requirement analysis phase critical in software development?

Ans: The requirement analysis phase is important because it helps everyone understand what the software should do. It involves talking to users and finding out what they need. This helps the team build the right product. If this step is skipped or done poorly, the software might not work the way users want, which can waste time and money. Good planning at this stage makes the rest of the project go more smoothly.

22. What is the role of software analysis in the development process?

Ans: Software analysis plays a key role in identifying and documenting the functional and non-functional requirements of a system. It involves studying user needs, business rules, and system constraints to create a clear specification for what the software should do. This phase ensures that developers have a solid understanding of the system's goals and helps prevent errors or misunderstandings later in the development process. It also lays the groundwork for designing the system architecture and planning the development tasks.

23. What are the key elements of system design?

Ans: The key elements of system design include:

- Architecture Design – Defines the overall structure of the system, including how different components interact.
- User Interface (UI) Design – Focuses on how users will interact with the system, including layout, navigation, and usability.
- Data Design – Involves organizing and structuring the data, including database design and data flow.
- Component Design – Breaks down the system into smaller modules or components, detailing their functions and how they communicate.
- Security Design – Ensures the system is protected against threats by including authentication, authorization, and data protection measures.
- Performance Design – Focuses on system speed, scalability, and efficiency.

24. Why is software testing important?

Ans: Software testing is important because it helps make sure the software works correctly and is free of errors. It checks if the software meets the requirements and performs as expected. Testing helps find bugs and problems early, which saves time and money. It also improves the quality, reliability, and security of the software, making it safer and more effective for users.

25. What types of software maintenance are there?

Ans: There are four main types of software maintenance:

- Corrective Maintenance – Fixes bugs or errors found after the software is released.
- Adaptive Maintenance – Updates the software to work with new hardware, operating systems, or other changes in the environment.
- Perfective Maintenance – Improves the software by adding new features or making it run better.
- Preventive Maintenance – Makes changes to prevent future problems, such as improving code quality or updating outdated parts.

26. What are the key differences between web and desktop applications?

Ans: □ Platform:

- Web Applications run in a web browser and do not need to be installed.

- Desktop Applications are installed directly on a computer and run from there.

 Internet Requirement:

- Web Applications usually need an internet connection to work.
- Desktop Applications can often work without the internet.

 Accessibility:

- Web Applications can be accessed from any device with a browser.
- Desktop Applications are limited to the device they are installed on.

 Updates:

- Web Applications are updated automatically on the server.
- Desktop Applications often need to be updated manually on each device.

 Performance:

- Desktop Applications may offer better speed and performance since they use the device's full power.
- Web Applications might be slower but are easier to maintain and use across devices.

27. What are the advantages of using web applications over desktop applications?

Ans:

- Accessibility: Web applications can be accessed from any device with an internet connection and a browser, making them easy to use anywhere.

- No Installation Required: Web apps don't need to be installed on each device, saving storage space and setup time.
- Automatic Updates: Web applications are updated automatically on the server, so users always have the latest version without needing to manually install updates.
- Cross-Platform Compatibility: Web apps can run on different operating systems (Windows, macOS, Linux) without needing separate versions for each.
- Centralized Data: Since web applications store data on remote servers, users can access the same information from any device, ensuring consistency and ease of management.
- Lower Maintenance Costs: The software is maintained and updated on the server, reducing the need for individual device management and updates.

28. What role does UI/UX design play in application development?

Ans: UI (User Interface) and UX (User Experience) design play a crucial role in application development by focusing on how users interact with the app and how they feel about that interaction.

- UI Design: This refers to the visual elements of the application, such as buttons, icons, colors, and layout. A well-designed UI makes the app visually appealing, easy to navigate, and intuitive to use.
- UX Design: This focuses on the overall experience of the user, ensuring the app is easy to use, functional, and meets the user's needs. UX design involves understanding the user's behavior, goals, and pain points to create a smooth and enjoyable experience.

29. What are the differences between native and hybrid mobile apps?

Ans:

- Development:

1. Native Apps are built specifically for one platform (iOS or Android) using platform-specific programming languages (Swift/Objective-C for iOS, Java/Kotlin for Android).
2. Hybrid Apps are built using web technologies (HTML, CSS, JavaScript) and can run on multiple platforms with a single codebase.

- Performance:

1. Native Apps offer better performance because they are optimized for a specific platform and have direct access to the device's hardware.
2. Hybrid Apps might be slower compared to native apps because they rely on web views and may not fully utilize the device's hardware.

- User Experience (UX):

1. Native Apps provide a smoother, more responsive user experience that is closely integrated with the device's operating system.
2. Hybrid Apps might have a less seamless experience since they don't fully mimic the native feel of the platform.

- Development Time and Cost:

1. Native Apps require separate development for each platform, which can be time-consuming and expensive.
2. Hybrid Apps are cheaper and faster to develop since one codebase can be used across both iOS and Android platforms.

- Access to Device Features:

1. Native Apps can access all the device's features (camera, GPS, sensors, etc.) without restrictions.
2. Hybrid Apps may have limited access to device features, though this is improving with modern frameworks.

30. What is the significance of DFDs in system analysis?

Ans: Data Flow Diagrams (DFDs) are important in system analysis because they visually represent how data moves through a system. DFDs help in understanding and documenting the flow of information, processes, and storage within a system. The key benefits include:

- Clarity: DFDs provide a clear and simple way to show how data enters, moves through, and exits a system, making it easier for developers, analysts, and stakeholders to understand the system's functionality.
- Problem Identification: By mapping out processes and data flows, DFDs help identify inefficiencies, redundancies, or potential areas of improvement in the system.
- Requirements Gathering: DFDs help gather system requirements by illustrating how information flows between different components of the system, which aids in defining the system's needs.
- Communication Tool: DFDs are a useful tool for communicating system functionality to both technical and non-technical stakeholders, ensuring everyone is on the same page.
- System Design: They are also essential in the design phase, providing a foundation for creating databases, developing user interfaces, and ensuring proper system integration.

In summary, DFDs help break down complex systems into manageable components, making it easier to analyze, design, and communicate system processes.

31. What are the pros and cons of desktop applications compared to web applications?

Ans: Pros:

- Performance: Desktop applications often provide faster performance because they directly utilize the computer's hardware resources without relying on an internet connection.
- Offline Availability: They can work without an internet connection, making them ideal for use in areas with limited or no internet access.
- Better Integration: Desktop apps often integrate more seamlessly with the operating system and can make better use of system resources (e.g., memory, processing power).
- Security: Since they are stored locally on the device, they may offer better control over data security, with fewer concerns about online threats.

Cons:

- Platform Dependency: Desktop applications typically need separate versions for different operating systems (Windows, macOS, Linux), which can increase development and maintenance costs.
- Updates: Users need to manually download and install updates, which can lead to outdated software if updates are not managed properly.

- Limited Accessibility: They can only be used on the device they are installed on, limiting access across multiple devices.
- Installation and Setup: Desktop apps require installation, which can be time-consuming and might take up significant storage space on the device.

32. How do flowcharts help in programming and system design?

Ans: Flowcharts are essential tools in both programming and system design because they visually represent processes and workflows. They help:

- Simplify Complex Logic: Break down complicated processes into simpler steps, making them easier to understand.
- Improve Communication: Provide a clear visual that helps developers and non-technical stakeholders understand the system.
- Aid in Debugging: Help trace and fix issues by showing the flow of logic.
- Enhance Code Structure: Guide programmers in designing well-organized, efficient code.
- Document Systems: Serve as documentation for future maintenance and updates.

In short, flowcharts make processes clearer, improve design, and help with troubleshooting.