Computer Networks Assignment II

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Question 1

1. What is a computer network?

A computer network is a collection of interconnected devices such as computers, servers, and mobile devices that can communicate with each other and share resources. These networks enable data exchange and resource sharing among devices, providing various functionalities that enhance productivity, communication, and access to information.

2. Usages of computer networks:

Computer networks have a wide range of applications across different domains:

- **Communication:** Networks facilitate various forms of communication, including email, instant messaging, video conferencing, and social networking platforms. These tools enable real-time interaction and information exchange among users globally.

- **Resource Sharing:** Networks allow multiple users to share resources such as printers, files, and storage devices. This sharing improves resource utilization and reduces costs by eliminating the need for duplicate equipment.

- **Information Access:** Through networks, users can access vast amounts of information available on the World Wide Web and in databases. This access supports research, education, and informed decision-making.

- **Distributed Computing:** Networks enable distributed computing systems like grid computing and cloud computing. These systems harness the power of multiple computers to perform complex computations and provide scalable services to users.

- **Entertainment:** Networks support various entertainment services, including online gaming and streaming media. These services provide users with interactive and on-demand content, enhancing their leisure experiences.

- **Collaboration:** Networks facilitate collaboration among individuals and teams by providing tools for document sharing, project management, and virtual meetings. This collaboration enhances productivity and innovation.

- **Remote Access:** Networks enable remote access to systems and resources, allowing users to work from anywhere. This capability is crucial for remote work, telecommuting, and accessing systems during travel.

- **E-commerce:** Networks power e-commerce platforms, enabling online shopping, electronic payments, and digital marketplaces. These platforms provide convenience and expand market reach for businesses and consumers.

3. Layers of the OSI model and their functions:

The Open Systems Interconnection (OSI) model is a conceptual framework that standardizes the functions of a telecommunication or computing system into seven distinct layers:
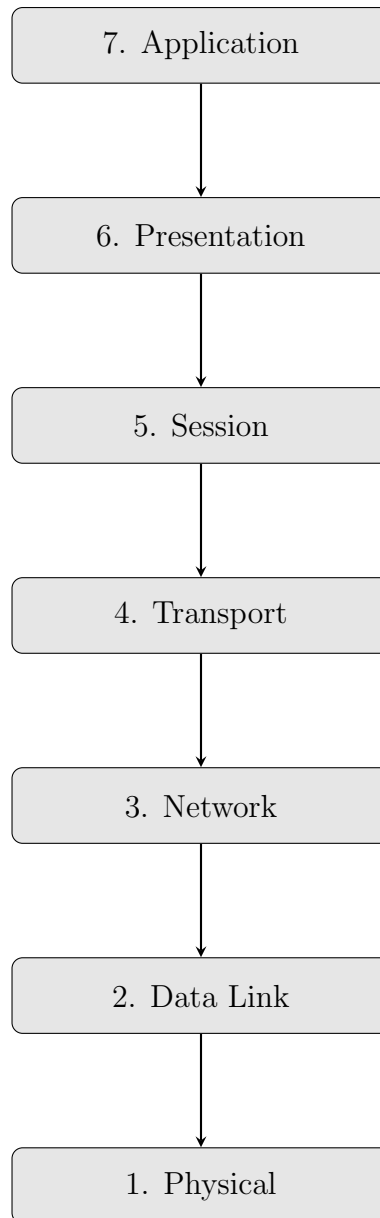

Figure 1: OSI Model Layers

- **Application Layer:** Provides network services directly to user applications such as web browsers and email clients. It facilitates end-user processes and network services.
- **Presentation Layer:** Ensures data is in a usable format and handles data

encoding, encryption, and compression. This layer translates data between the application layer and the network.

- **Session Layer:** Manages and controls the connections between computers. It establishes, maintains, and terminates connections between applications.

- **Transport Layer:** Provides reliable data transfer services to the upper layers. It ensures data integrity and correct sequencing, offering error recovery and flow control.

- **Network Layer:** Determines the best physical path for data transmission. This layer handles logical addressing and routing of data packets across different networks.

- **Data Link Layer:** Handles the transfer of data frames between adjacent network nodes. It ensures error-free transmission between devices on the same network segment.

- **Physical Layer:** Transmits raw bit streams over a physical medium. This layer deals with the physical connection between devices, including cables, switches, and other hardware.

4. **Difference between OSI and TCP/IP models:**

OSI Model	TCP/IP Model
Theoretical framework developed by ISO	Practical framework developed by DARPA
7 distinct layers	4 integrated layers
Application, Presentation, Session, Transport, Network, Data Link, Physical	Application, Transport, Internet, Network Access
Separates functions into highly specified layers	Layers are more flexible with overlapping functions
Used mainly for teaching and understanding concepts	Widely used in actual network implementations
Strict layer separation, each layer serves the layer above it and is served by the layer below it	Less strict, allows for direct interaction between non-adjacent layers
Protocol standards are defined by the International Organization for Standardization (ISO)	Protocol standards are defined by the Internet Engineering Task Force (IETF)
Focuses on data flow from one computer to another	Focuses on ensuring end-to-end communication over interconnected networks
More comprehensive and detailed	More streamlined and efficient for practical use
Designed before the advent of the Internet	Designed with the Internet in mind