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## **ESP Homework (4)**

### **Question 1**

#### **Section A: Vocabulary in Context**

→ Broadcast: refers to transmission by radio or television.

e.g. The new episode will be **broadcast** tonight on television!

→ Circuit switching: telephone switches reserve a dedicated two-way circuit for the duration of the call, this method is known as circuit switching.

e.g. Phone calls use **circuit switching** which means they establish a dedicated communications channel or circuit between two phones.

→ Packet: slices of data that are used for data transmission across networks.

e.g. Any data you send over the internet is broken into **packets**.

→ Router: is a networking device that forwards data packets between computer networks.

e.g. The idea for a **router** initially came about through an international group of computer networking researchers called the International Network Working Group.

→ Latency: the delay before a transfer of data begins.

e.g. We have faced poor performance due to **network latency**.

→ Bandwidth: refers to the maximum rate at which data can be transmitted over a network connection.

e.g. I'm thinking about changing my internet service provider because the provided **bandwidth** is too low.

→ Internet backbone: refers to the core infrastructure that forms the foundation of the global Internet.

e.g. **Internet backbone** consists of the largest and fastest networks, linked by connections and advanced routers.

## Section B: Reading Comprehension

1. Unlike internet streams which use packets to transmit data across different routers, radio uses one-way communication by broadcasting one signal to many receivers from a single tower.
2. Circuit switching reserves a dedicated channel for the entire duration of a call, ensuring continuous and stable communication while packet switching divides data into packets that travel across different routers which may cause unpredictable delivery times.
3. They ensure packets follow the most efficient route through various hops among ISPs.
4. Because packets often follow different routes and every extra “hop” adds latency or delay.
5. Even a fast hosting provider cannot guarantee smooth video because the overall streaming quality is limited by the slowest network segment between the server and the viewer.

## Section C: True / False / Not Given

1. True
2. False
3. False
4. True
5. False

## Section D: Short Writing (120 – 150 words)

Packet switching both helps and hinders streaming video. As an advantage, it increases network robustness by breaking data into small packets that can be resent if lost. On the other hand, data transmission through different routes may result unpredictable delivery times. Some of these packets may arrive quickly, others slowly, and a few may be lost at all. That's what which causes videos to pause, stutter, and skip. Also, the overall streaming quality is limited by the slowest network segment of the path between the server and the user. To overcome these issues, content providers can use **adaptive bitrate streaming**. This technique dynamically adjusts the video quality in real time based on network conditions, thereby reducing the effect of packet delays and ensuring a smoother viewing experience regardless of user's device, location, or internet speed.

## Question 2

### Section A: Short-Answer Questions

1. PPI interfaces are often flat and lack deep binding pockets, making small-molecule targeting difficult.
2. X-ray crystallography and nuclear magnetic resonance (NMR) spectroscopy
3. fragment-based drug discovery (FBDD) typically identifies low-affinity fragments which can be optimized into effective modulators without needing to screen vast compound libraries.
4. protein–protein docking
5. Because modulating or disrupting these abnormal PPIs offers the potential to treat these diseases by disrupting the signaling pathways or protein complexes that contribute to their development.

### Section B: Long-Answer / Discussion Questions

1. PPI interfaces are usually large, flat, and lack well-defined binding pockets, making it difficult for small molecules to achieve high-affinity binding. In contrast, traditional targets often have deep, well-formed active sites.
2. Advanced machine learning techniques, such as attention-based convolutional neural networks, LSTM models and hybrid models are employed in recent approaches. These methods integrate local contextual information and global sequence features to improve prediction accuracy and address challenges like data imbalance.
3. Although being computationally challenging due to protein physics and vast sequence space, creating proteins *de novo* offers complete control over protein structure and function. This shift allows the discovery of novel folds or structural elements as building blocks for innovative proteins.

### Section C: Fill-in-the-Blank Items

1. flat
2. X-ray crystallography - nuclear magnetic resonance (NMR) spectroscopy
3. fragments
4. Virtual
5. & 6. protein domain

### Section D: Multiple-Choice and True–False

1. **B.** Graph Neural Networks
2. **C.** 130,000–650,000

3. **False**
4. **B.** Presence of hydrophobic patches

### Question 3

#### PASSAGE 1

1. **A.** prevalent
2. **C.** these results
3. **B.** Introduction
4. **C.** Based on the debugging studies, array or iteration bugs were less difficult to identify than assignment bugs.
5. **3) I and III**

#### PASSAGE 2

1. **A.** human resource
2. **C.** As it demonstrates the position of engineers in a leading company
3. **D.** electronics engineers
4. **B.** Developing electronic data-processing systems was among the early activities of Engineering Research Associates.
5. **B.** Only II