

# Answer Key: MAQB

## Section 1 (6 marks per question)

**Q1. Explain the role of the transport layer in the TCP/IP model and its core functionalities.**

**Keywords:**

TCP, UDP, Segments, Ports

**Main Points:**

- Provides end-to-end communication
- Segments/reassembles data
- Manages connections

**Detailed Explanation:**

The transport layer sits between the application and network layers, handling process-to-process communication. It divides application data into segments for sending and reassembles them at the receiver. It also manages connections (TCP) or provides connectionless communication (UDP).

**Examples:**

- A web browser (application layer) uses TCP (transport layer) to request a webpage from a server. The transport layer breaks the request into segments, sends them to the network layer, and reassembles the response segments at the browser.

**Q2. Describe multiplexing and demultiplexing at the transport layer.**

**Keywords:**

Multiplexing, Demultiplexing, Port numbers

**Main Points:**

- Allows multiple applications to share network connection
- Uses port numbers for identification
- Performed at sender/receiver

**Detailed Explanation:**

Multiplexing allows multiple applications on a host to share the same network connection. Demultiplexing is the reverse process at the receiver, delivering data to the correct application. Port numbers are used to identify the applications.

**Examples:**

- Multiple applications like web browser, email client, and video streaming can simultaneously use the same network connection thanks to multiplexing/demultiplexing.

### **Q3. Compare and contrast connection-oriented (TCP) and connectionless (UDP) transport protocols.**

#### **Keywords:**

TCP, UDP, Reliable, Connectionless

#### **Main Points:**

- TCP: Reliable, ordered delivery
- UDP: Unreliable, faster
- Different use cases

#### **Detailed Explanation:**

TCP establishes a connection before data transfer, ensuring reliable, ordered delivery with error correction. UDP is connectionless, offering faster but unreliable transfer. TCP is suitable for applications requiring data integrity (e.g., file transfer), while UDP is preferred for real-time applications (e.g., video streaming).

#### **Examples:**

- File transfer uses TCP for guaranteed delivery, while online gaming often uses UDP for lower latency despite potential packet loss.

### **Q4. How does the transport layer achieve process-to-process communication?**

#### **Keywords:**

Port numbers, IP address, Process, Client, Server

#### **Main Points:**

- Uses port numbers
- Combines with IP address for unique identification
- Client-server model

#### **Detailed Explanation:**

The transport layer uses port numbers to identify the specific processes running on the hosts. Combined with the IP address, this enables process-to-process communication. The client initiates communication with the server, which listens on a specific port.

#### **Examples:**

- A web browser (client) connects to a web server (port 80) on a specific IP address.

### **Q5. What are the principles of reliable data transfer, and explain the stop-and-wait mechanism?**

#### **Keywords:**

Reliable data transfer, ACK, Error detection, Stop-and-wait

#### **Main Points:**

- Error detection/correction

- Acknowledgements
- Retransmissions
- Stop-and-wait: Sender sends one segment, waits for ACK before next

***Detailed Explanation:***

Reliable data transfer ensures data arrives correctly and in order. It uses mechanisms like error detection codes, acknowledgements (ACKs), and retransmissions. Stop-and-wait is a simple protocol where the sender sends one segment and waits for an ACK before sending the next.

***Examples:***

- If a segment is lost or corrupted, the receiver doesn't send an ACK, prompting the sender to retransmit in stop-and-wait.