1. Streaming video systems can be classified into three categories. Name and briefly describe each of these categories.
   Answer:

   - HTTP streaming
   - UDP streaming
   - Adaptive HTTP streaming

HTTP streaming – the video is stored in an HTTP server, with a specific URL. The client establishes a TCP connection with the server and issue an HTTP GET request for the URL. The server sends the video file, within an HTTP response message. (page 684)

UDP streaming – the server transmits video at a rate that matches the client's video consumption rate by clocking out the video chunks over UDP at a steady rate.

Adaptive HTTP streaming – Dynamic Adaptive Streaming over HTTP (DASH) – the video is encoded into several different versions, each having a different bit rate and correspondingly, a different quality level. The client requests chunks of video segments of a few seconds in length. When the amount of available bandwidth is high, the client manually selects chunks from a high-rate version; and when the available bandwidth is low, it naturally selects from a low-rate version. The client selects different chunks one at a time with HTTP GET. (page 148)

2. List three disadvantages of UDP streaming:
   1. Due to the unpredictable and varying amount of available bandwidth between server and client, constant-rate UDP streaming can fail to provide continuous playout. (pag. 683)
   2. It requires a media control server, such as an RTSP server, RTSP server, to process client-to-server interactivity requests and to track client state (e.g., the client's playout point in the video, whether the video is being paused or played, and so on) for each ongoing client session. (page 683)
   3. Many firewalls are configured to block UDP traffic, preventing users behind these firewalls from receiving UDP video. (page 683)

III. What is a packet that is received after its scheduled playout time considered lost?

Answer: Here we define packet loss: a packet is lost either if it never arrives at the receiver or if it arrives after its scheduled playout time. (page 694) From the perspective of the application, the packet has been lost.

4.a How are different RTP streams in different sessions identified by a receiver?

RTP streams in different sessions are identified by a receiver by different multicast addresses. (page 701)

4.b How are different streams from with the same session identified?

Different streams within the same session are identified by SSRC field. (page 702)

5.a What is the role of a SIP registrar?

Every SIP user has an associated registrar. Whenever a user launches an SIP application on a device, the application sends an SIP register message to the registrar, informing the registrar of its current IP address. (page 707)

5.b How is the role of SIP registrar different from that of a home agent in Mobile IP?

Bob’s registrar keeps track of Bob’s current IP address. Whenever Bob switches to a new SIP device, the **new device sends a new register message, indicating the new IP address.** (page 707) On the other hand, In Mobile Internet Protocol (Mobile IP), a home agent is a router on a mobile node's home network that maintains information about the device's current location, as identified in its care-of address. The home agent uses tunneling mechanisms to forward Internet traffic **so that the device's IP address doesn't have to be changed each time it connects from a different location**. A home agent may work in conjunction with a foreign agent, which is a router on the visited network. (source: https://searchnetworking.techtarget.com/definition/home-agent)