Please DO NOT upload questions and answers onto the Internet.

1.1	C	1.2	E	1.3	B	1.4	D	1.5	C
1.6	C	1.7	E	1.8	A	1.9	B	1.10	D

2.

(a) **400 Mbps**

(b) **120 Mbps**

(c) **81 μs**

3.

(a) **16 ms**

(b) **3**

4.

(Multiple possible answers. Below is one example)
***Encrypted hash of the message*: digital signature of Alice used to prove her identity to Bob. Alice's private key is used.**
***Encrypted message*: message encrypted with the session key to ensure confidentiality of the message. Session key is a symmetric key.**
***Encrypted session key*: session key encrypted with Bob's public key. The purpose is to share the session key with Bob.**

5.

(a)

FTP runs over TCP – need to ensure files are uploaded/downloaded intact;

Live video streaming often runs over UDP – fast; relatively stable throughput.

(b)

Switch	Router
Layer-2 device	Layer-3 device
Self-learning	Need manual configuration
Forward link layer frames	Forward IP datagrams
Used in a subnet	Used to connect subnets

(c)

An IP address logically comprises two parts: network prefix and host ID. This is designed to facilitate routing: routers check prefix and deliver a packet to an aggregated destination network. If MAC address is used instead, hierarchical routing cannot be achieved. For example, MAC address is burnt in ROM and usually cannot be changed. When people carry their laptops around the world, devices in a subnet won't have common prefix in MAC addresses. This makes routing difficult as routers have to remember routing for every single MAC address.

6.

(a) **Yes. Premature timeout and retransmitted packet delivered to application.**

(b) **Yes. Premature timeout and retransmission. The next new packet is lost but undetected because the sender treats the duplicate ACK as the acknowledgement for the next packet.**

(c) **No**

7.

(a) **3**

(b) **2**

(c) **1**

(d) **5**

8.

(a) $\alpha \geq 11$, since $d_z(y) \geq 1$, $c(x,z) = 10$, and $\alpha = d_x(y) = c(x,z) + d_z(y)$.

(b) $d_w(z) \leq 6$, since $d_x(z) \leq c(x,z)$, and therefore $c(x,w) + d_w(z) \leq 10$.