1. (1 pts) What is the difference between a host and an end system? List several different types of end systems. Is a Web server an end system?
2. (1 pts) Suppose there is exactly one packet switch between a sending host and a receiving host. The transmission rates between the sending host and the switch and between the switch and the receiving host are *R*1 and *R*2, respectively. Assuming that the switch uses store-and-forward packet switching, what is the total end-to-end delay to send a packet of length *L*? (Ignore queuing, propagation delay, and processing delay.)
3. (1 pts) How long does it take a packet of length 1000 bytes to propagate over a link of distance 2500 km, propagation speed 2.5 \* 108 m/s, and transmission rate 2 Mbps? More generally, how long does it take a packet of length *L* to propagate over a link of distance *d*, propagation speed *s*, and transmission rate *R* bps?
4. (1 pts) Suppose end system A wants to send a large file to end system B. At a very high level, describe how end system A creates packets from the file. When one of these packets arrives to a router, what information in the packet does the router use to determine the link onto which the packet is forwarded? Why is packet switching in the Internet analogous to driving from one city to another and asking directions along the way?
5. (1 pts) What are the five layers in the Internet protocol stack? What are the principal responsibilities of each of these layers?
6. (1 pts) Suppose Alice and Bob are sending packets to each other over a computer network. Suppose Trudy positions herself in the network so that she can capture all the packets sent by Alice and send whatever she wants to Bob. List some of the malicious things Trudy can do from this position.
7. (1 pts) Suppose you wanted to do a transaction from a remote client to a server as fast as possible. Would you use UDP or TCP? Why?
8. (1 pts) Why do HTTP, SMTP, and IMAP run on top of TCP rather than on UDP?
9. (1 pts) Consider an e-commerce site that wants to keep a purchase record for each of its customers. Describe how this can be done with cookies.
10. (1 pts) Describe how Web caching can reduce the delay in receiving a requested object. Will Web caching reduce the delay for all objects requested by a user or for only some of the objects? Why?
11. (1 pts) Consider a new peer Alice that joins BitTorrent without possessing any chunks. Without any chunks, she cannot become a top-four uploader for any of the other peers, since she has nothing to upload. How then will Alice get her first chunk?
12. (1 pts) CDNs typically adopt one of two different server placement philosophies. Name and briefly describe them.
13. (1 pts) For the client-server application over TCP, why must the server program be executed before the client program? For the client-server application over UDP, why may the client program be executed before the server program?