

## 433-522 Internet Technologies

### *Practice Exam – Model Answers*

**Question 1:**

Give two examples to explain why wireless computing does not necessarily mean mobile computing and mobile computing does not necessarily mean wireless computing.

*Examples: A notebook computer that hooks up to the Internet with a cable, and a PC in an old building that is hooked up to the LAN with a wireless connection.*

**Question 2:**

Briefly explain one of the main reasons why coaxial cables can be preferred to a twisted pair.

*It has better construction mechanics and shielding so it has better noise immunity and also has higher bandwidth. It also can span longer distances due to its construction and shielding too.*

**Question 3:**

Why do we need two keys and the public-key algorithms when we can simply use symmetric-key algorithms with one key?

*The distribution of a single key becomes the problem with symmetric-key algorithms. With public-key algorithms, the key that is used by everyone is already not a secret.*

**Question 4:**

What is a Message Digest? Briefly explain.

*A message digest is a hash-function that takes arbitrarily long text data in and gives out a fixed length bit string. It has to be easy to compute, hard to find the reverse mapping (i.e., bit string to text) for, hard to find two texts that map to the same bit string, and also has to facilitate the property that changing the input text (even a little) gives a totally different output. The message digests are needed to decouple two concepts; secrecy and authentication. This is, fundamentally, driven by efficiency in coding.*

**Question 5:**

What is bit stuffing? Explain briefly in the context of the Data Link Layer.

*To signal a start/end of a frame we may use a special flag byte (e.g. 01111110). To distinguish a flag byte from data that may also contain accidental occurrences of the flag byte, we put an extra 0 bit in after every sequence of 5 1's in the original data stream. In this way, the flag byte will be unique in the final data sequence.*

**Question 6:**

Compare Go-Back-N and Selective Repeat elementary Data Link protocols, what is the main trade-off between the two?

*The trade-off is between bandwidth and buffer space. Go-Back-N wastes bandwidth but saves buffer space. Selective Repeat does the reverse.*

**Question 7:**

Briefly explain the relative strengths and weaknesses of contention and contention free protocols in the MAC sublayer.

*Under high traffic loads, contention-based protocols are less attractive due to bandwidth wasted by collisions. Under low traffic loads, contention free protocols are less attractive due to the overhead required to request reservations.*

**Question 8:**

Briefly explain how the basic Bit-Map collision-free protocol works.

*There is a contention period, divided into the number of stations in the network. First, in some numerical order, each station relays whether it has data to send or not in its contention slot (by emitting a 1). Then, after contention, in the order of already emitted 1s, stations send their frames and finally repeat the algorithm.*

**Question 9:**

Increasing the bandwidth given a frame size is accepted as a perfect strategy to improve the Ethernet performance. State why this statement may not be true.

*We discussed that for the proper execution of the Ethernet, there is a minimum frame size that has to be used that is proportional to the propagation time of the medium. If the bandwidth is increased then the minimum frame size should also increase. You either need to wait for your frame to fill up or fill it with redundant bits of data just to send a small burst of data over the network.*

**Question 10:**

What is a routing algorithm in the context of the Network Layer?

*A routing algorithm is a part of the network software that works on the nodes of the network and decides, given an input line and some incoming data on it, which output line has to be used to propagate the transmission.*

**Question 11:**

What do adaptive routing algorithms take into account in comparison to non-adaptive ones?

*Adaptive routing algorithms take into account the changes in the topology of the network and sometimes the traffic on it.*

**Question 12:**

A Class A network uses a subnet mask of 255.254.0.0. How many subnets are available in the Class A network if it uses this mask? Note that a Class A network has a 24 bit host field.

*The subnet mask is 11111111 11111110 00000000 00000000. Since Class A addresses use 24 bits for the host field, there are 7 bits used for the subnet id using mask. Thus, there are  $2^7 = 128$  subnets possible.*

**Question 13:**

What does a transposition cipher do?

*This type of ciphers changes the order of letters in a message but not the letters themselves.*

**Question 14:**

What is perceptual coding in the context of Audio Compression? Name one example technique.

*This technique is based on the limits and flaws in human auditory system and codes audio data using these. MP3 is an example.*

**Question 15:**

What is UDP? Briefly explain.

*UDP stands for User Datagram Protocol. It is the Internet transport protocol that supports connectionless transfer of data.*

**Question 16:**

What is a Remote Procedure Call? Give one reason why it cannot be implemented under all circumstances using UDP.

*It is a call to a procedure that is not on your host that your program is running but to on a remote host (possibly over a large distance over the Internet). If the call requires a transmission that is larger than the maximum packet size for UDP we cannot use UDP for this purpose. Also, if the operation cannot be repeated safely, such as incrementing a counter, it may be necessary to establish a TCP connection for it.*

**Question 17:**

What is DNS and why do we need it?

*DNS stands for Domain Name System. The need for people to use meaningful addresses rather than numbers and to prevent a frequent need to change addresses (such as email addresses) with changing servers (and their numeric IP addresses) derived this concept. It is a hierarchical, domain-based, naming system that is used to map meaningful names for humans to IP addresses used by machines.*

**Question 18:**

What is IMAP and why do we need it while we can use POP3?

*IMAP is a protocol used for the delivery of emails to the users. Unlike POP3, IMAP does not assume that users will download their email to the local machines every time they connect to read email. So it is better suited to an environment where users access their email accounts from different machines (e.g., in café's).*

**Question 19:**

What is the difference between a plugin and a helper application in the context of the WWW?

*A plugin runs inside the browser but a helper application is a separate process.*

**Question 20:**

List 3 protocol operations provided by SNMP Version 1, and briefly explain the purpose of each of these protocol operations.

*Get – Retrieve the value of an object instance from an agent.*

*Set – Set the value of an object instance in an agent.*

*Trap – Used by an agent to asynchronously send an alert to the Network Management System*