# CSAS 3211 Practice

What do the following terms mean: IP number; IP name; DHCP; DNS; TCP; UDP; IP; router; host; DSL; client; server

Give a short answer to each of the questions:

1. Why do networks in general use layers?
2. In the network layer of TCP/IP, do packets arrive in the same order they are sent?
3. How does “1-complements checksum” work? Give an example of computing a 1-complements checksum of two 8-bit words.
4. Describe briefly what happens when your laptop boots up and connects for the first time to a web server *www.exoticname.org*.
5. If a ‘class B’ license consists of fixing the first 2 parts of an IP number, then how many class-B licenses can exist on the Internet, and how many machines can be part of any ‘class B’ licensee?
6. What is a class A Internet license?

Explain how you could convert positive integers to binary numbers (i.e. sequences of bits). If 16 bits are used to represent integers, how many different positive integers could you represent? Which integer is represented by the binary number 100100, assuming only positive integers are used? Convert the integer 42 into a binary number.

List the different layers, including – very briefly – their responsibilities, of the OSI reference model. Contrast that with the TCP/IP model.

Suppose the graph below represents a subnet, where the numbers on the edges represent distances between the attached routers. Use the Dijkstra Shortest Path algorithm to find the shortest path from A to D. Fill in the labels of all nodes you encounter while applying that algorithm. Create a complete sink tree for node D.



We have covered several routing algorithms in the network layer, among them shortest path, flooding, distance vector, and link state routing (improved) algorithms. Describe these routing algorithms. What is the principle difference between distance vector and link state routing (improved) algorithms?

Consider a subnet with 6 routes named A, B, C, D, E, and F. Suppose that for distance vector routing the following vectors have just arrived at router C.

from B: (5, 0, 8, 12, 6, 2) (i.e the distance B-A is 5, B-B is 0, B-C is 8, B-D is 12, B-E is 6, and B-F is 2),
from D: (16, 12, 6, 0, 9, 10); and from E: (7, 6, 3, 9, 0, 4);

The measured delays from C to its neighbors B, D, and E are 6, 3, and 5, respectively. What is C’s new routing table? Give both the outgoing line to use and the expected delay.

What is the “count-to-infinity” problem, and for which routing algorithm does it apply? How does the other routing algorithm manage to avoid that problem?

Describe some pros and cons of flooding as a routing algorithm.

Give at least one example each for a computer application that would use (a) a connection-oriented, reliable service and (b) a connectionless, unreliable service

In which layer of TCP/IP do TCP and UDP services exist? What is the major difference between these services? Give at least one example of an application that uses TCP and one that uses UDP services.

What is the structure of a TCP packet and what is the meaning of each field

What is the structure of a UDP packet and what is the meaning of each field

What is the structure of a IPv4 packet and what is the meaning of each field

What is the structure of a IPv6 packet and what is the meaning of each field

Describe the difference between flow control and congestion control. How does flow control work at the TCP level? How, in principle, does congestion control work?

Describe the phases of a TCP connection process. What is a SYN-flood attack?

In class we discussed the Internet protocol and its proposed successor known as IPv6.

* 1. What is the maximum number of hosts that can be addressed using IPv4 addresses and IPv6 addresses, approximately (ignoring details such as reserving bits for special purposes)
	2. IPv6 no longer uses a header checksum field. Discuss – briefly – the pros and cons of that.
	3. What are the advantages of IPv6 over IPv4?
	4. List a typical IPv4 address. List a typical IPv6 address.
	5. Seton Hall has a “class B” Internet license. What does that mean?
	6. Can you can intercept IP packets even though your machine is neither the sender nor the receiver of those packets? Where must your machine be located? Does this present a security problem for Internet traffic, and how could you overcome the problem?

In class we discussed some key aspects of the Transport Layer.

* 1. What is the main purpose of the transport layer? Make sure to mention ports and their purpose.
	2. What two services are offered at the transport layer by the TCP/IP model and what are their differences
	3. How does TCP enhance IP?
	4. How does UDP enhance IP?
	5. Describe the purpose of sequence numbers, acknowledgements, timers, and retransmission in TCP
	6. Describe how TCP turns IP into a reliable service.
	7. What does “sliding window” refer to and why is it useful?

In class we discussed several protocols in the Internet application layer such as “http”, “smtp”, “daytime”, and “telnet”.

* 1. What are the standard ports for http, smtp, and telnet? Why is there a need for 'standardization' of ports? What is the smallest port you can use for your own non-standard protocol?
	2. Can you connect to a server speaking “http” with a client that does not speak that language? If so, what is the most likely result of doing so? Make sure to distinguish between “connecting” and “obtaining useful results”.
	3. List a valid request in http 1.1
	4. Why might a network administrator try to restrict an smtp server from delivering mail from “foreign” clients? How could the smtp server distinguish between traffic originating from “foreign” and “internal” systems?

In class we discussed the Java classes “ServerSocket”, “Socket”, and “DatagramSocket” that use the TCP and UDP services of the transport layer, respectively.

* 1. Create a Java server that accepts TCP connections on port 1234, closes a connection as soon as it is accepted, and continues to wait for additional connections after that.
	2. Create a Java client that connects to a TCP server “test.shu.edu” on port 1234, sends the string “test client 101” and expects a single answer string to be returned by the server. When the client receives the answer string it prints it to the console and disconnects. The server can be assumed to cooperate, i.e. if you successfully connect and send your string, the server will reply with a single string (you do not have to write the code for that server).
	3. Create a Java program to send a UDP datagram containing the integer 42 to the machine “test.shu.edu” on port 1234.