**Final Review:**

**The final exam is cumulative: 30% of the questions covers topics from weeks 1-7, 70% covers topics from weeks 8-14.**

Chapters 1 and 2:

* Protocol
  + Properties
  + Specification
  + Design
* Internet Protocols
  + TCP/IP – 4 layers and 5 layers
    - Understand the differences between 4 layers and 5 layers
    - Understand each layer’s function
  + OSI model
    - Understand each layer’s function
    - Understand the differences between OSI model and TCP/IP model (5 layer).

Chapters 3 and 4:

* DNS, Internetworking and transport layer
* HTTP
* FTP
* Client Server
* Peer to peer (P2P)

Chapters 5, 6, and 7

* Data Communication Framework
  + Understand Encryptor, Encoder, Modulator, Decryptor, Decoder, Demodulator, Multiplexor, Demultiplexor
* Analog Signal
  + Sine wave characteristics (amplitude, frequency, phase)
  + Fourier analysis
  + Analog bandwidth
  + Frequency Domain
* Digital Signal
* Analog to digital conversion
* Digital to analog conversion
* Synchronization
* Transmission media
  + Guided
    - Twisted Pair
    - Coaxial
    - Fiber optic
  + Unguided
    - Infrared
    - Laser
    - Terrestrial Radio
    - Satellite
* Wireless Transmission
* Radio Transmission
* Satellites
* Measuring Transmission Media
  + Propagation Delay
  + Nyquist’s Theorem (don’t need to memorize the formula)
  + Shannon’s Theorem (don’t need to memorize the formula)

Chapter 13

* LAN Technologies
* Network Topology (bus, token ring, star, mesh)
* Unicast, Multicast, Broadcast, Anycast

Chapter 15, 21, 23

* Ethernet
* IPv4 & IPv6
  + Subnetting
  + CIDR
* DHCP
* CIDR
* ARP

Chapters 9, 10, 11

* Transmission modes
  + Parallel
  + Serial (asynchronous, synchronous, isochronous)
  + Ethernet transmission order (Big Endian, little Endian, unicast, multicast, broadcast)
* Modulation (analog and digital)
* Multiplexing and demultiplexing (FDM, WDM, TDM, CDM)
* Access Technologies (dialup, broadband)

Chapter 16

* Wireless Network
  + Wifi
  + Ad-hoc
  + Cellular network

Chapter 22, 23

* Datagram forwarding
* ICMP
* NAT

Chapters 24, 25, 26:

* Transport layer
* UDP
* TCP
* Internet Routing and routing protocols:
  + IGP
  + EGP
  + BGP
  + OSPF
  + RIP

Chapters 27, 28, 29

* Network Performance
  + QoS
  + DiffServ
  + CBR (Constant Bit Rate)
  + VBR (Variable Bit Rate):
  + ABR (Available Bit Rate):
  + UBR (Unspecified Bit Rate):
* Multimedia And IP Telephony (VoIP)
* Network Security
  + Firewalls
  + Intrusion Detection
  + DMZ
  + Encryption
    - Symmetric Key encryption
    - Asymmetric Key encryption
  + Digital Signature
  + SSL/TLS
  + VPN
  + Network attacks
    - Wiretapping: Making a copy of packets as they traverse a network to obtain information
    - Replay: Sending packets captured from a previous session
    - Buffer overflow: Sending more data than a receiver expects in order to store values in variables beyond the buffer
    - Address Spoofing: Faking the IP source address in a packet to trick a receiver into processing the packet
    - Name Spoofing: Using a misspelling of a well-known name or poisoning a name server with an incorrect binding
    - DoS and DDoS: Flooding a site with packets to prevent the site from successfully conducting normal business
    - SYN flood: Sending a stream of random TCP SYN segments to exhaust a receiver’s set of TCP connections. This can be considered a sub-category of DoS and DDoS attacks
    - Key Breaking: Automatically guessing a decryption key or a password to gain unauthorized access to data
    - Port Scanning: Attempting to connect to each possible protocol port on a host to find a vulnerability
    - Packet interception: Removing a packet from the Internet which allows substitution and man-in-the middle attacks

Labs:

* LINUX basic commands learned from labs 1 through 4

Lab 1

-Pwd = print working directory

-ls = list files in current directory

-ls -A = command that shows all files in your home directory (excluding . and ..).

-wc= used to count lines, words, and characters in files or data “piped” to it from another program

-mkdir = create directory

-ls -a | wc -l = used to count the items

-cat = open file

- grep “string you are searching” = searches lines in the input stream for a specified string or pattern

- man “command” = a complete description from the manual

Lab 2-3

- chmod -x = used to remove execute permissions from a file

- ping -c 10 192.168.18.y = command is used to see if a specific IP address is online

- echo = displays a line of texts

- ifconfig = Find the Ethernet/MAC address and the IP address of the network interface card

- ifconfig enp0s3 192.168.18.x = to manually assign an IP address

- arp –n = to view the contents of the ARP cache

Homework

* Assignments from weekly learning modules

REVIEW EXAM

Review Questions - Computer Networks and Internets – Professor: Dr. Dang

1. Protocols in layer \_\_\_\_\_ specify communication between two computers across the Internet.
   1. 1
   2. 2
   3. 3
   4. 4
   5. 5
2. Three major types of protocols being used with email are:
   1. Transfer
   2. Access
   3. Representation
   4. All of the above
3. The overall purpose of the Domain Name System:
   1. to provide a service that maps human-readable symbolic names to computer addresses.
   2. to allow easy access to the network
   3. Easy to remember hostname than IP address
   4. All of the above
4. Telnet, HTTP, FTP, SMTP, POP4, VoIP, SNMP are examples of:
   1. Application layer
   2. Network layer
   3. Data Link layer
   4. Transport layer
5. TCP and UDP operate at \_\_\_\_\_\_\_\_\_\_\_ layer:
   1. Transport
   2. Network
   3. Data Link
   4. Application
6. IP operates at the:
   1. Application layer
   2. Network layer
   3. Physical layer
   4. Transport layer
7. RJ-45, Ethernet (IEEE802.3) operate at the:
   1. Application layer
   2. Network layer
   3. Physical layer
   4. Transport layer
8. A term referring to a data link header and trailer, plus the data encapsulated between the header and trailer
   1. Frame
   2. Packet
   3. Segment
   4. Protocol data unit
9. The placement of data from a higher-layer protocol behind the header (and in some cases, between a header and trailer) of the next-lower-layer protocol.
   1. Encapsulation
   2. De-encapsulation
   3. Adjacent-layer interaction
   4. Same-layer interaction
10. IPV6 includes:
    1. Unicast, Broadcast, Multicast
    2. Unicast, anycast, broadcast
    3. Anycast, multicast, broadcast
    4. Anycast, unicast, multicast
11. Which piece of a data communications system handles analog input?
    1. Information sources
    2. Encryptor
    3. Encoder
    4. Modulator
    5. Multiplexor
12. \_\_\_\_\_\_\_\_\_connect devices that can be far apart, potentially hundreds or thousands of miles apart.
    1. LANs
    2. WANs
    3. MANs
    4. Both a and b
13. The router forwarding logic include:
    1. Forward the frame
    2. Find the best route to the destination address
    3. Compare the packet’s inside a new data-link header and trailer
    4. Ensure the frame had no errors
    5. All of the above
14. TCP supports
    1. Error recovery
    2. Flow control using windowing
    3. Connection establishment and termination
    4. Ordered data transfer and data segmentation
    5. All of the above
15. UDP supports
    1. Error recovery
    2. Multiplexing using ports
    3. Connection establishment and termination
    4. Ordered data transfer and data segmentation
    5. None of the above
16. FTP, SSH, Telnet, SSL use \_\_\_\_\_\_\_\_\_\_
    1. TCP
    2. UDP
    3. Both a and b
    4. None of the above
17. DHCP, SNMP, ICPM, VoIP use
    1. TCP
    2. UDP
    3. Both a and b
    4. None of the above
18. DNS uses
    1. TCP
    2. UDP
    3. Both a and b
    4. None of the above
19. The IPv6 address of 192.168.1.3 is:
    1. ::FFF:C0A8:103
    2. ::FFF:B0A8:103
    3. ::FFF:E0A8:103
    4. None of the above
20. NAT translates \_\_\_\_\_\_\_\_\_ addresses that pass between the site and the internet
    1. Source
    2. Destination
    3. Both a and b
    4. None of the above
21. IPv6 address binding:
    1. Maintains a neighbor cache
    2. Keeps the cache up-to-date at all times
    3. Polls neighbors periodically
    4. All of the above
22. NFS uses TCP/IP to
    1. Allow easy access
    2. Allow shared file access
    3. Allow limited access
    4. All of the above
23. Which of the following statement regarding stateless packet filter is true?
    1. Tracks status of TCP connections
    2. Can admit packets that “make no sense” (e.g. dest port = 80, ACK bit set, even though no TCP connection is established
    3. Is more secure than stateful packet filter
    4. All are false
24. Demilitarized zones (DMZ) is used to:
    1. Isolate servers from the rest of the network
    2. Allow access to trusted network
    3. Block outbound traffic
    4. Block inbound traffic
25. Data Encryption Standard (DES) uses:
    1. 56 bit symmetric key and 64-bit plaintext input
    2. 64 bit symmetric key and 64-bit plaintext input
    3. 56 bit symmetric key and 32-bit plaintext input
    4. 64 bit symmetric key and 32-bit plaintext input
26. Which statements regarding Advanced Encryption Standard (AES) is true?
    1. Uses 128, 192, or 256 bit keys
    2. Uses 128 bit blocks
    3. Is considered more secure than DES
    4. Is a symmetric key standard to replace DES
    5. All of the above
27. Which of the following statement is true?
    1. Symmetric key systems encrypt and decrypt with the same key
    2. Asymmetric key systems encrypt and decrypt with different keys
    3. Asymmetric key systems are more secure than symmetric key systems
    4. Both a and b
    5. None of the above
28. Consider the following example: Alice encrypts message with her private key and sends it to Bob. Which of the followings is true?
    1. Bob decrypts message with Alice’s public key
    2. Bob knows the message was encrypted with Alice’s private key
    3. Anyone with Alice’s public key could read the message
    4. Both a and b
    5. All of the above