Name_____

# Final Exam
# CIS 68C2-01
# Spring 2002

## Instructions

- Write your name at the top of every sheet.
- For **True/False** and **Multiple Choice** questions, circle the **single** correct answer (true or false, or one of the appropriate letters a – e).
- For **Short Answer** questions, write your answer in the space provided. Be as specific as you possible. Last year, I lost my mind reading ability and am no unable to determine what you *meant* to say!
- If you need additional space for your answers, note it in your answer, and use the back of the page.
- If you are unclear about something, raise your hand.
- Any form of cheating will result in an automatic F in the course.

## Hints for Success

- Use your knowledge of the fundamentals, and draw conclusions from there.
- Use UNIX-specific language and terminology to be more specific than plain English.
- Read each problem carefully!
- Try to determine the skills or knowledge a question is attempting to assess.
- Make sure you answer all parts of a short answer question - some have several parts.
- Decide if a general answer or specific answer is the best choice.
- There is no penalty for incorrect answers.
- Relax, have fun, do your best, and good luck!

Name_____

## True / False (1 point each)

1. TCP/IP is an implementation of the OSI networking reference model. (True / False)
2. FTP cannot use UDP as the transport protocol. (True / False)
3. The address 190.14.97.255 is a class B broadcast address. (True / False)
4. It is not permitted to use the first and last (all 0's and all 1's) subnets. (True / False)
5. Super-netting and sub-netting is essentially the same thing. (True / False)
6. All IP networking devices make routing decisions. (True / False)
7. ARP is useful when you need to map a hostname to an IP address. (True / False)
8. The DNS/BIND system cooperates with WHOIS to resolve name server lookups. (True / False)
9. Unlike PC-LAN systems, UNIX networking systems are all co-equal. (True / False)
10. BOOTP and DHCP provide dynamic TCP/IP configuration services (True / False)

## Multiple Choice (2 points each)

11. TCP/IP is best described as:
    a. the Internet Protocol
    b. a formal rule for networking
    c. a suite of protocols
    d. Teaching Can Promote over Indulgent People
    e. Transmission Control Protocol / Intranet Protocol

12. ICMP is:
    a. used to ping another system
    b. Internet Congestion and Monitoring Protocol
    c. a set of control messages for TCP/IP-based systems
    d. supported in both UDP and TCP
    e. both (a) and (d)

13. The 3c509 Linux device driver module is software that implements: either (a) or (c) accepted as correct
    a. the data-link layer
    b. the physical layer
    c. the network access layer
    d. all of the above
    e. none of the above

14. The number of bits in the network part of the Multicast Address 224.95.102.3 is:
    a. 24
    b. 16
    c. 8
    d. 0

15. The number of hosts that can be meaningfully supported on network 220.97.43.64/31 is:
    a. 0
    b. 1
    c. 2
    d. the address is invalid

Name_____

16. The order of the standard headers in a frame (as presented on the wire) is:
    a. MAC header, Protocol header, and then the IP header
    b. Protocol header, IP header, and then the MAC header
    c. MAC header, IP header, Protocol header, and then the RPC header
    d. MAC header, IP header, and then the Protocol header
    e. Depends on the application

17. Combining the network addresses 201.202.202.0/24 and 201.202.203.0/5 to create 510 hosts is called:
    a. aggregating
    b. sub-netting
    c. super-netting
    d. both (a) and (c)
    e. none of the above

18. OSPF, RIP, and RIP-2 are all examples of:
    a. interior routing protocols
    b. printer control languages
    c. exterior routing protocols
    d. all of the above

19. The file /etc/protocols contains:
    a. a list of application or service port numbers
    b. a list of number/name mappings for the third word of the IP datagram
    c. network program numbers
    d. none of the above

20. The portmapper is used for which of the following services: either (b) or (e) accepted as correct
    a. NIS / NIS+
    b. all RPC-based programs
    c. NFS
    d. DNS
    e. all but (d)

21. The purpose of the Makefile in /var/yp is to:
    a. build the NIS software binaries
    b. start the yp* processes on the slaves
    c. create the source database files
    d. update the DBM files and notify slaves

22. The NIS service can provide information for the following flat files:
    a. /etc/passwd and /etc/groups
    b. /etc/auto.master
    c. /etc/services, /etc/protocols, /etc/rpc, /etc/networks
    d. all of the above

23. The correct execution sequence for an NIS client is:
    a. ypbind, portmap, domainname
    b. domainname, portmap, ypbind
    c. portmap, domainname, ypbind
    d. either (b) or (c)

Name_____

24. The routed and gated daemons implement:
    a. RIP
    b. RIP-2
    c. OSPF
    d. all of the above

25. The DNS namespace:
    a. is a hierarchical tree of domains
    b. has a forward and a reverse branch
    c. is rooted at **.**
    d. all of the above

26. An server that is authoritative for a zone must be:
    a. a master or a slave server
    b. a caching server
    c. non-recursive
    d. forwarding server

27. Consider the entries below:

```
11.200.0.192.in-addr.arpa.        IN PTR eek.gasps.sounds.org.
21.200.0.192.in-addr.arpa.        IN PTR squeek.gasps.sounds.org.
31.200.0.192.in-addr.arpa.        IN PTR argh.gasps.sounds.org.
```

    They are most likely from the file:
    a. /etc/named.conf
    b. db.192.0.200
    c. db.200.0.192
    d. db.gasps
    e. named.ca

28. A server that is authoritative for a zone must be:
    a. a master or a slave server
    b. a caching server
    c. a recursive server
    d. forwarding server

29. The purpose of the hints file is to:
    a. determine the location of the slave DNS servers
    b. define the NS records
    c. contains NS and *glue* A records for the root servers
    d. all of the above
    e. none of the above

30. The syntax ***name ttl class type data*** is the syntax for:
    a. some zone files
    b. all resource records
    c. SOA records
    d. RDS records
    e. both (c) and (d)

Name_____

## Short Answer (5 points each)

31. Name TCP/IP's major success factors._____

    1) Open Standards, 2) Universal Addressing Scheme, 3) Hardware independence, and 4) Standard High Level Protocols and Applications

32. Name the five key responsibilities of the Internet Protocol, defined in RFC 791. _____

    1) Defines the datagram, 2) Defines the IP addressing scheme, 3) Passes data between Network Access and Transport Layers, 4) Routing, and 5) Fragmentation and Re-assembly.

33. Name the primary field from each header that directs data from the wire to a listening program (list the fields in the order it is received).

    **Destination MAC Address** (from MAC header) ← **Destination IP Address** (from the IP header) ← **Destination Port Address** (from Protocol header).

34. What are the three main schemes or considerations for delivering TCP/IP data? _____

    1) Addressing, 2) Routing, and 3) Multiplexing

35. If a subnet mask and the network mask are different concepts, then a) why is only one required, and b) how does a system know which one is appropriate?

    Both terms depend on context, and refer to the mask applied to specify the two parts of an IP address – the network part and the host part. The term subnet mask is used locally within an organization, and refers to the mask used by routers routing data on subnetted networks. The term network mask or netmask is the more generic term, and is used to refer to the mask used by external routers delivering packets to the organizations gateway. These external routers do not know about the organizations subnetting scheme. Only one mask (subnet, netmask) is required since IP requires only a single mask per route to make routing decisions. The system does not need to know which one is appropriate, because there is only one mask per route.

36. Give the number of subnets, the network address, subnet mask, and broadcast address for the address 19.47.3.25/13.

    # of subnets: 2^5 = 32; network address: 19.40.0.0; subnet mask: 255.248.0.0; broadcast address: 19.47.255.255

37. What are the key components of each entry in the routing table?_____

    1) Destination address, 2) Gateway, 3) Network mask, 4) Interface

38. Unique on the internet, a socket is the combination of: _____

    Port + IP Address

39. Define and describe the term root_squash._____

    root_squash is an NFS server security setting available per exported filesystem. NFS requests are accompanied by the UID/GID of the NFS client user making the request. Since NFS relies on the client's notion of UID/GID, an NFS client user with UID/GID 0 will have access to any files and directories on NFS server (the exported filesystem) that are owned by UID/GID 0. To prevent this, the NFS server will map UID/GID 0 access requests to a non-privileged UID/GID, by default -2. This prevents remote root users from having privileged access to UID/GID owned files on the NFS filesystems.

Name_____

40. Assuming you are in an NFS-mounted directory that you own, what are the three requirements for being able to create a new file within that directory? _____

    1) The directory permissions on the server must allow creating a new file, 2) the filesystem must be exported writable by the server, and 3) the filesystem must be mounted as writeable.

41. To mount an NFS filesystem, which server and client processes are required to be running? _____

    Server requires: portmap, nfsd, and mountd. Client requires only portmap.

42. What is the general reason for and purpose of MIME? _____

    SMPT mail only defined the mail headers, not the body of the message. SMTP only supports 7 bit, simple ASCII text mail bodies. To accompany complex message bodies and different data types, MIME was created. It extends SMTP essentially by defining an encoding mechanism to allow for complex mail bodies.

43. Why are telnet, rsh, rlogin, POP, and FTP considered insecure? _____

    They all use clear text passwords, which are very easily snoop-able using a network packet sniffer.

44. Name three primary Directory Services._____

    NIS (or NIS+), LDAP, X.500

45. In order, state the basic messages of the DHCP client/server conversation._____

    DHCPDISCOVER (client) → DHCPOFFER(server) → DHCPREQUEST(client) → DHCPACK/DHCPNAK(client).

46. Explain PORT and PASV commands in FTP. _____

    The PORT command is given just prior to a data transfer request, and supplies the ftp server with an IP address and a high-number port so that the FTP server can initiate the data connection to the client. The PASV command instructs the FTP server to supply the client an IP address/port number, so that the client instead can initiate the data connection (the server is passive in this case, hence the term PASV).

47. What is the zone name of the reverse branch of the host gumby.pokey.org with IP address 153.233.19.4/16?_____

    233.153.in-addr.arpa.

48. What is the purpose of the file /etc/ftpaccess? _____

    It is the configuration file that is used for the configuration of the WU-FTP server daemon. It allows definitions of such things as user types (real, guest, anonymous), classes, provides general server options, security, user quotas and limits, etc.

49. The IP address of host losaltos.fhda.edu is 153.18.75.202. Assuming all services are up and running, explain various causes for the output below:

```
$ ping losaltos.fhda.edu
ping: unknown host losaltos.fhda.edu
$ ping 153.18.75.202
153.18.75.202 is alive
```

There is a failure in some name service, since the basic network appears to work by hostname to IP address translation does not appear to work. Since we are told "all services are up and running", this implies that the client is not correctly configured to use the services, or that the name to IP address information does not actually exist. If the /etc/hosts file is being used for name servers, it probably does not contain an entry for lostaltos.fhda.edu. If NIS is being used before files, the NIS db files may not have been updated since the entry was added to the hosts file. If DNS is being used, the resolver configuration file /etc/resolv.conf may not exist, or specify appropriate name servers.

50. Explain a) the service switch file, b) how it works, and c) a high-level description of how it is implemented. _____

Various administrative data, such as password and group information, name services, various TCP/IP network configuration information, and automounter configuration information can come from multiple database sources. The service switch file /etc/nsswitch.conf provides the system administrator with a mechanism for selecting which administrative databases are used by various network services. Each entry in the file specifies a type of administrative data and the database(s) (or services) to be queried in the order listed.

The switching is implemented via standard networking library functions used by all networking applications. The functions implement code to access data from each of the supported databases, and they use the /etc/nsswitch.conf file to determine which databases to query.

Name_____

## Extra Credit (5 points each)

51. Describe the basics of how the auto-mounter is implemented and works. _____

    There are two forms of automounter – autofs and amd. The autofs implementation uses a kernel-level pseudo-filesystem that triggers calls back to an automount daemon to perform the actual mount of a specified filesystem. A startup provides the system with the mount points to use as the virtual filesystem. Any activity referencing objects within that filesystem is noticed by the kernel (when it tries to resolve path names given to it in a system call such as open(2), readdir(2), etc.), and the automount daemon (one per map) is waiting to be woken up to cause a mount of a filesystem.

52. Describe the Who, What, When, Where, Why, and How of routing. _____

    Who: IP performs routing

    What: Routing is TCP/IPs decision maker for switching packets from one network to another.

    When: All packets received by IP are considered for routing.

    Where: packets are routed to attached networks or dropped.

    Why: Packets can only be delivered to hosts or gateways on directly connected networks. Packets must be sent to gateways for further routing.

    How: IP consults its routing table, looking for a route on which to send a packet. A packet is deliverable if there is an entry in the route table whose Destination address matches the destination IP address of the packet masked with that route entries mask value. Matched packets are forwarded through the entries specified interface; unmatched packets are dropped, their destinations unreachable.