

**Part 1: Multiple Choice (108 points - 3 points per question)**

- (A) 1. Which is `man -k` equivalent to? (A) `apropos` (B) `whatis` (C) `which` (D) none of the above
- (D) 2. Which can be used to find a file called `shell.ppt` under the current directory or its subdirectories?  
(A) `find shell.ppt` (B) `find . -print unix.ppt` (C) `find . shell.ppt` (D) none of the above
- (C) 3. Which can be used to locate the binary, source, and manual page files for a command?  
(A) `find` (B) `which` (C) `whereis` (D) `locate`
- (C) 4. Which can be used to search for a file named exactly `data`?  
(A) `locate data` (B) `locate . data` (C) `locate -b '\data'` (D) none of the above
- (B) 5. Which can be used to show the full path of (shell) commands? (A) `find` (B) `which` (C) `whereis` (D) `locate`
- (C) 6. Which can be used to print lines matching `Unix` in the all files in the current directory and its subdirectories?  
(A) `grep Unix */*` (B) `grep Unix *` (C) `grep */* Unix` (D) none of the above
- (C) 7. Which can be used to put a process in the background? (A) `!!` (B) `>` (C) `&` (D) `Ctrl-C`
- (A) 8. Which system variable is used to store the PID of the current shell? (A) `$$` (B) `#!` (C) `$$%` (D) `%%$`
- (C) 9. Which can be used to find out the complete command line of a process run by user `arvil`?  
(A) `ps -a -u arvil` (B) `ps -u -d arvil` (C) `ps -f -u arvil` (D) none of the above
- (B) 10. Which is used to provide a dynamic real-time view of a running system? (A) `jobs` (B) `top` (C) `w` (D) `last`
- (D) 11. Which can be used to show the list of users who last logged in the system?  
(A) `w` (B) `who` (C) `finger` (D) none of the above
- (A) 12. Which is not equivalent to `wc < in > out`? (A) `< out wc > in` (B) `< in wc > out` (C) `wc > out < in` (D) `> out wc < in`
- (A) 13. Which can be used to show who is logged on and what they are doing?  
(A) `w` (B) `who` (C) `finger` (D) none of the above
- (B) 14. Which is the correct way to use the `nice` command?  
(A) `nice 5 ps` (B) `nice +5 ps` (C) `nice -d ps` (D) none of the above
- (A) 15. Which is a daemon to execute scheduled commands? (A) `cron` (B) `nice` (C) `w` (D) `last`
- (D) 16. Which can be used to add a file info into a archive `data.tar`?  
(A) `tar -zxf data.tar info` (B) `tar -xvf data.tar info` (C) `tar -cvf data.tar info` (D) none of the above
- (B) 17. Which cannot be used restore to a compressed file to its original format? (A) `gzip -d` (B) `bzip2` (C) `gunzip` (D) `zcat`
- (C) 18. Which can be used to show the content of a zip file without extracting a file?  
(A) `unzip -t` (B) `unzip -d` (C) `unzip -Z` (D) `unzip -x`
- (D) 19. Which OSI layer can provide a connection-oriented link between two hosts?  
(A) `agent` (B) `connection` (C) `service` (D) none of the above
- (B) 20. Which is the port number for HTTP? (A) 22 (B) 80 (C) 88 (D) 8080
- (A) 21. Which can be used to check if the connection to a host is fine? (A) `ping` (B) `netstat` (C) `arp` (D) `route`
- (D) 22. Which can be used to print the route packets trace to a network host?  
(A) `netstat` (B) `route` (C) `routetrace` (D) none of the above
- (B) 23. Which can be used to print network connections and routing tables? (A) `arp` (B) `netstat` (C) `route` (D) `ping`
- (C) 24. Which can be used to configure a network interface? (A) `arp` (B) `netstat` (C) `ifconfig` (D) `route`
- (A) 25. Which is the port number for SSH? (A) 22 (B) 23 (C) 25 (D) 80
- (D) 26. Which does not support SSH? (A) SFTP (B) FileZilla (C) PuTTY (D) none of the above
- (C) 27. When `sftp` is used, which is used to upload a file? (A) `hash` (B) `get` (C) `put` (D) `recv`
- (A) 28. Which can be used to show the mapping of IP and hardware addresses? (A) `arp` (B) `netstat` (C) `route` (D) `ping`
- (B) 29. Which can be used to know the current shell? (A) `echo shell` (B) `echo $SHELL` (C) `echo ~` (D) `which shell`
- (B) 30. Which can be used to know a user's default shell? (A) `w` (B) `finger` (C) `who` (D) `which`
- (D) 31. Which shell can specify the user cannot log into the system in `/etc/passwd`?  
(A) `/bin/bash` (B) `/bin/csh` (C) `/bin/ksh` (D) `/sbin/nologin`
- (C) 32. Which can be used to repeat the previous command in a Unix shell? (A) `!0` (B) `!$` (C) `!!` (D) `$$`
- (A) 33. Which can be used to show the list of the previous commands a user was typing?  
(A) `history` (B) `list` (C) `w` (D) none of the above
- (A) 34. Which files cannot be removed by `rm *[a-d]b?*`? (A) `chab` (B) `cadbit` (C) `abc` (D) `bbc`
- (D) 35. Which can be used to indicate a shell script is a executable `csh` file?  
(A) `!/bin/csh` (B) `$/bin/csh` (C) `##$/bin/csh` (D) none of the above
- (B) 36. Which can be used to terminate all processes a user creates?  
(A) `kill -9 $!` (B) `kill -9 0` (C) `kill -9 $$` (D) none of the above

## Part 2: Questions and Answers (88 points)

1. (a) (3 points) What is a process?
- (b) (3 points) What are the foreground and background processes?
- (c) (3 points) What is a zombie?
- (d) (3 points) What is a daemon? Give an example in Unix.

Ans:

- (a) A process is a program in execution.
- (b)
  - A foreground process is a process that is interacting with users.
  - A background process is a process that is running without user interaction.
- (c) A zombie is a process that has completed execution but still has an entry in the process table.
- (d) A daemon is usually a server program that runs in the background.

The followings are some examples of Unix daemons: crond, httpd, nfsd, smtpd, sshd.

2. (10 points) Explain the five job control facilities in Unix and write the commands for each facility.

Ans:

- (a) Put a job to the background (bg).
  - (b) Bring it back to the foreground (fg).
  - (c) List the active jobs (jobs).
  - (d) Suspend a foreground job ([Ctrl-z]).
  - (e) Kill a job (kill).
3. (a) (2 points) Write the command to show the environment variables.
  - (b) (2 points) Write the command to show the content of the system path.
  - (c) (2 points) Write the command to add the current directory into the system path.
  - (d) (2 points) Use the alias command to define `psa` is equivalent to `ps -aux`.
  - (e) (2 points) Output the result of `who` and `date` into a file `who-date`.
  - (f) (2 points) Write the command to run the command `ls -R /` and output it into a file `file-tree` in the background.

Ans:

- (a) `env`
- (b) `echo $path` or `echo $PATH`
- (c) `set path = (. $path)` or `set PATH = (.$PATH)`
- (d) `alias psa "ps -aux"`
- (e) `(who; date) > who-date`
- (f) `ls -R / > file-tree &`

4. (a) (3 points) Write a data compression command and give an example of using it.
- (b) (3 points) Write a data uncompression command and give an example of using it.
- (c) (3 points) Use the `tar` command to pack the directory `/usr/src/data` and compress the tar file to `data.tar.gz`.
- (d) (3 points) Use the `tar` command to unpack and uncompress the above file.

Ans:

- (a) `gzip data`
- (b) `gunzip data.gz`
- (c) `tar -zcvf data.tar.gz /usr/src/data`
- (d) `tar -zxvf data.tar.gz`

5. (10 points) Complete the following table listing the seven layers in the OSI 7-Layer Reference Model. Then, identify the four layers used in the TCP/IP protocol suite (write TCP/IP beside them). Finally, identify where the following protocols belong: ARP, HTTP, UDP, IP, SMTP.

Layer	Layer Name	TCP/IP suite	Protocol
7	Application Layer	Application Layer	HTTP, SMTP
6	Presentation Layer		
5	Session Layer		
4	Transport Layer	Transport Layer	UDP
3	Network Layer	Interent Layer	ARP, IP
2	Data Link Layer	Link Layer	
1	Physical Layer		

6. (a) (3 points) What does DNS stand for? Explain it.
- (b) (2 points) Write two commands that use DNS.
- (c) (3 points) What does DHCP stand for? Explain it.

Ans:

- (a) The Domain Name System (DNS) is a system for mapping domain names and IP addresses.
- (b) nslookup and dig
- (c) Dynamic Host Configuration Protocol (DHCP) is a protocol used by networked devices (clients) to obtain the information necessary for operation in an Internet Protocol network.

7. (a) (2 points) What is a Unix shell?
- (b) (3 points) Which functions does the shell has?
- (c) (3 points) Which shells do MS DOS and Windows have respectively?
- (d) (3 points) List 3 different shells in Unix.
- (e) (3 points) Which command can be used to change the shell used by a user? Give an example.

Ans:

- (a) A Unix shell is an interface for users to access the Unix operating system.
- (b) A shell has two main functions: an interface for users to access the system and command interpreter.
- (c) The shell of MS DOS is command.com. The shell of Windows is explorer.exe.
- (d) Bourne shell (sh), Bourne-Again shell (bash), Korn shell (ksh), C shell (csh), Z shell (zsh)
- (e) chsh can be used to change the default shell used by a user.  
chsh -s /bin/zsh can be used to change the default shell to the zsh shell.  
or  
A user can just type in the shell program to change the shell.  
bash can be used to change the user's shell to the bash shell.

8. (10 points) Write a C shell script to read the first term  $a$ , the ratio  $r$ , and number  $n$  and calculate the result of the following series  $a + ar + ar^2 + \dots + ar^{n-1} + ar^n$ .

```
#!/bin/csh
echo "Enter a: \c"
set a = $<
echo "Enter r: \c"
set r = $<
echo "Enter n: \c"
set n = $<
set i = 1
set term = 1
set sum = 1
while ($i <= $n)
    @ term = $term * $r
    @ sum = $sum + $term
    @ i = $i + 1
end
@ sum = $a * $sum
echo $sum
```