



UNIVERSITY OF COLOMBO, SRI LANKA



UNIVERSITY OF COLOMBO SCHOOL OF COMPUTING

DEGREE OF BACHELOR OF INFORMATION TECHNOLOGY (EXTERNAL)



Academic Year 2020 – 3rd Year Examination – Semester 6

IT6205 - Systems and Network Administration

Structured Question Paper

(TWO HOURS)

To be completed by the candidate

BIT Examination Index No:

Important Instructions:

- The duration of the paper is **02 (Two) hours**.
- The medium of instruction and questions is **English**.
- Students should answer in the medium of the English language **only**.
- This paper has **04 questions** and **12 pages**.
- Answer **ALL** questions. All questions carry equal marks.
- Write your answers in English using the space provided in this question paper.
- Do not tear off any part of this answer book.
- Under no circumstances may this book, used or unused, be removed from the Examination Hall by a candidate.
- Note that questions appear on both sides of the paper. If a page is not printed, please inform the supervisor immediately.
- **Calculators are NOT allowed.**

Questions Answered

Indicate by a cross (×), the numbers of the questions answered.

	Question Numbers				Total
	1	2	3	4	
To be completed by the examiners:					

- 1) (a) When a user resigns and no longer access the system, what are the actions a system administrator should take?

(4 marks)

ANSWER IN THIS BOX

- The user's account must be disabled.
- All the files owned by the account should be backed up and then disposed of so that the system does not accumulate unwanted baggage over time.

(b)

- (i) What is meant by a Linux distribution?

(3 marks)

- (ii) What are the differences between Ubuntu Linux and CentOS Linux?

(3 marks)

ANSWER IN THIS BOX

- (i) A typical Linux distribution comprises a Linux kernel, GNU tools and libraries, a package management software, documentation, a window system (the most common being the X Window System), a window manager, and a desktop environment.
- (ii) Ubuntu forked from Debian and CentOS is based on the open source code of Red Hat Enterprise Linux.
- Ubuntu is probably better for Linux beginners because it's easier to set up and use, and CentOS is probably better for businesses who want a more stable and secure Linux distribution.

(c) Linux defines seven types of files.

(i) Write down the Linux commands required to **create** the following file types **given in the answer box.**

(3 marks)

(ii) What is the default permission of the **user**, **group**, and **other** of a file created after executing the following Linux command?

```
$umask 027
```

(3 marks)

(iii) A system user can change his/her password using the **passwd** command without having the root privileges. However, such users do not have write access to the `/etc/passwd` and the `/etc/shadow` system files. Explain how the **passwd** command, executed as a regular user, changes the contents of the `passwd` file?

(3 marks)

ANSWER IN THIS BOX

(i)

File Type	Command to create such a file
Character Device File	mknod
Local Domain Socket	socket
Named Pipe	mknod

(ii) The **umask 027** command allows all permissions for the owner but forbids write permission to the group and allows no permissions for anyone else.

(iii) The **passwd** command is owned by the root user and the **setuid** bit is enabled in the `passwd` file. If anybody executes the **passwd** program, by default it's taking the privilege of owner (root) of the file. This means any user can get root privilege to execute the **passwd** program, because only the root user can edit or update `/etc/passwd` and `/etc/shadow` file. When the normal user runs the **passwd** program on his terminal, the **passwd** program is run as "root", because the effective UID is set to "root". So, the normal user can easily update the file.

- (d) During the Bootstrapping process, the kernel is loaded into the memory and begins to execute. What will be the first process of execution after the kernel probes the system's hardware?

(3 marks)

ANSWER IN THIS BOX

The system's initialization (init) process, which is always process number 1 will be executed. These procedures are managed by a series of shell scripts (init scripts) that are run in sequence by init process.

- (e) A file descriptor is an abstract indicator (handle) used to access a file or other input/output resource in a UNIX/Linux environment.

- (i) Write down one (1) such standard file descriptor abbreviation with its corresponding file descriptor number.

(1 mark)

- (ii) What is the outcome of the following Bash shell command?

```
$ ls -l /etc/* 1>file1.txt 2>file2.txt
```

(2 marks)

ANSWER IN THIS BOX

- (i) Any one of the following: stdin (0), stdout(1) or stderr(2).
- (ii) This will display files and directories of /etc directory and the output (stdout) will be directed to file1.txt and any errors (stderr) will be directed to file2.txt.

- 2) (a) The UNIX/Linux shutdown command can be used to shut down a system. List three (3) modes or options of the shutdown command.

(3 marks)

ANSWER IN THIS BOX

With the shutdown command, one can specify the system should

- Halt or power off
- Reboot
- Run in single-user mode

- (b) The following questions are based on RAID systems.

- (i) What is the extra advantage one can gain by employing a RAID system than using several disks?

(2 marks)

- (ii) What is the main reason for using “hot spare” disks in certain RAID implementations?

(2 marks)

ANSWER IN THIS BOX

- (i) A set of disks concatenate a multiple drive to create a single, large virtual drive, it provides no data redundancy or performance benefits.

- (ii) Hot spare disks are used to limit downtime and the vulnerability of the array to a second failure. When a failure occurs, the faulted disk(s) is/are automatically swapped for the spare(s).

- (c) The following questions are based on managing Linux packages.
- (i) The advanced package tool (apt) is another package management tool available for Linux. Write down the Linux command to install a package called “**gimp**” using the apt tool. (3 marks)
 - (ii) Assume that you, as the systems administrator, need to install the above gimp package in two hundred machines in your LAN. Briefly explain how you would complete the above requirement using the apt tool. (3 marks)

ANSWER IN THIS BOX

- (i) **\$ sudo apt-get install gimp**
- (ii) **The better option would be to cache packages locally since downloading a copy of each package for every machine is not a sensible use of external Internet bandwidth. The apt-mirror is a repository and it is easy to configure and convenient for system administration. Can install apt-mirror as:**
\$ sudo apt-get install apt-mirror

- (d)
- (i) Write down the UNIX/Linux command to mount a filesystem on the disk partition /dev/sda4 under the path **/mnt/dataset**. Assume that the user who executes this command is in the /etc/sudoers list. (3 marks)
 - (ii) How would you configure the system to mount the disk partition /dev/sda4 on /mnt/dataset at boot time? (2 marks)

ANSWER IN THIS BOX

- (i) **\$ sudo mount /dev/sda4 /mnt/dataset**
- (ii) **Use /etc/fstab configuration file in /etc to enter the device name and the mount point.**

(e) Assume that **file.org** is a text file, and it contains the following text string “UNIX/Linux System Administration”.

(i) Write down the Linux command to create a soft link called **file.lnk** to the file **file.org**.
(2 marks)

(ii) What will be the output of the following Linux command?

\$ cat file.lnk

(2 marks)

(iii) What will be the output of the following Linux command if **file.org** is deleted from the system?

\$ cat file.lnk

(2 marks)

(iv) Write down the Linux command to delete/remove the file.lnk from the system.
(1 marks)

ANSWER IN THIS BOX

(i) Command should be:

\$ ln -s file.org file.lnk

(ii) Since it is a soft link, it will display the contents of the file.org.

The output will be:

UNIX/Linux System Administration

(iii) It will display an error message since the file.org is not exists.

The output will be:

cat: file.lnk: No such file or directory

(iv) Command should be:

\$ rm file.lnk

- 3) (a) Assume you have access to a web server running on the default port. You are given a command-line telnet interface to check whether the webserver is serving web pages or not. Write down the HTTP command that gives the following output during a telnet session.

```
HTTP/1.1 200 OK
Date: Sat, 03 Aug 2019 17:43:10 GMT
Server: Apache/2.2.3 (CentOS)
Last-Modified: Sat, 03 Aug 2019 16:20:22 GMT
Content-Length:7044
Content-Type: text/html
```

(2 marks)

ANSWER IN THIS BOX

GET / HTTP/1.1

- (b) Considering the output given in (a), what is denoted by “200” in line “HTTP/1.1 200 OK”.

(2 marks)

ANSWER IN THIS BOX

It is a status response code that indicates that the request has succeeded.

- (c) Assume you had to configure IP based virtual hosting for four (04) websites in an Apache webserver. You are provided a server with a CentOS GNU/Linux operating system installed with only a single network interface card (NIC).

- (i) Describe how you can fulfill the said virtual hosting requirement without using additional hardware (NIC) and only using the software utilities provided by the CentOS GNU/Linux system.

(4 marks)

ANSWER IN THIS BOX

Configure virtual network interfaces using ip or ifconfig utilities

Configure each interface using different IP addresses as IP based virtual hosting needs multiple IP addresses

- (ii) Write down one (01) advantage and one (01) disadvantage of name-based virtual hosting over IP-based virtual hosting?

(4 marks)

ANSWER IN THIS BOX

Advantage: Eliminates the need to assign unique IP addresses

Disadvantage: You must change the IP address of the site to move it to a different server

- (d) Your organization decided to use Java technologies for a new product. Therefore, you need to have application servers. List two (02) Open Source and two (02) commercial examples of popular web application servers.

(4 marks)

ANSWER IN THIS BOX

Open Source: (Any two)

- Tomcat or GlassFish
- JBoss or Jetty or other valid answer

Commercial: (Any two)

- WebSphere or WebLogic
- OC4J or Other valid answer

- (e) What is a resource record in a Domain Name Server (DNS)?

(2 marks)

ANSWER IN THIS BOX

Each DNS server maintains one or more pieces of distributed database that makes up the full name space. This piece of database consists of text files contain records for each of the resources and they are called resource records.

- (f) Consider the following part of DNS resource records for the **cmb.ac.lk** zone.

```
$ORIGIN cmb.ac.lk.
$TTL 2d
ftp.cmb.ac.lk. 8h IN CNAME www
www.cmb.ac.lk. IN CNAME olu
olu IN A 192.248.16.88
web.cmb.ac.lk. 8h IN A 192.248.16.99
```

- (i) What is the default time to live value of the ftp.cmb.ac.lk domain name? **(1 mark)**
- (ii) What is the default time to live value of the www.cmb.ac.lk domain name? **(1 mark)**
- (iii) What is the IP address of the ftp.cmb.ac.lk? **(1 mark)**
- (iv) What is the IP address of the www.cmb.ac.lk? **(1 mark)**
- (v) For this origin zone, write down the resource records required to configure the mail exchanger with the following details. The mail server name is mail.cmb.ac.lk, and it uses the IP address 192.248.16.100. **(3 marks)**

ANSWER IN THIS BOX

- (i) Default TTL = 8 hours
- (ii) Default TTL = 2 days
- (iii) IP address is 192.248.16.88
- (iv) IP address is 192.248.16.88
- (v) The following required to be added to the above resource records.
- | | | | |
|-----------------|----|----|-----------------|
| cmb.ac.lk. | IN | MX | mail.cmb.ac.lk. |
| mail.cmb.ac.lk. | IN | A | 192.248.16.100 |

4) (a)

- (i) The first statement of a Bash shell script would be the “**shebang**” statement. Write down the shebang statement.

(3 marks)

- (ii) Write a complete Bash shell script called “**myadd.sh**” to add two numbers and print the result when the two numbers added are given as the arguments below.

```

$./myadd 7 9
$Sum of 7 and 9 is 16

```

(6 marks)

ANSWER IN THIS BOX

- (i) The shebang statement declares the text file to be a script for the interpreter by /bin/bash.

#!/bin/bash

- (ii) The myadd.sh script file should be as follows.

#!/bin/bash

sum=0;

sum = \$((\$1 + \$2));

echo “Sum of \$1 and \$2 is \$sum”;

(b)

- (i) What is the outcome of the following Linux command?

\$crontab -r

(1 marks)

- (i) What is the outcome of the following cron entry in a Linux system?

55 23 * * 0-4,6 /var/services/bin/checkservers

(3 marks)

- (ii) What is the outcome of the Linux commands below?

\$touch myfile

\$getfacl myfile

(4 marks)

ANSWER IN THIS BOX

- (i) The command crontab -r removes current crontab list, leaving with no crontab file at all.

Space Continued ...

(ii) The cron entry will runs checkservers script at 11:55pm every day except Fridays.

(iii) The touch command will change the file time stamp and if the file does not exist it will create an empty file.

The getfacl command will get file access control list and display thee file name, owner, group and file access control list.

(c) Answer the following in the context of virtualization.

(i) What is meant by a “bare-metal” hypervisor?

(4 marks)

(ii) When bare-metal hypervisors are used, do we need to alter the kernel of the guest operating system?

(4 marks)

ANSWER IN THIS BOX

(i) They are called bare-metal hypervisors since thy control the physical hardware. Such hypervisor provides an emulation layer for all the host’s hardware devices

(ii) No kernel modification is required if bare-metal hypervisors are used.
