



UNIVERSITY OF COLOMBO, SRI LANKA



UNIVERSITY OF COLOMBO SCHOOL OF COMPUTING
DEGREE OF BACHELOR OF INFORMATION TECHNOLOGY (EXTERNAL)



Academic Year 2019 – 3rd Year Examination – Semester 6

IT6205 - Systems and Network Administration

Structured Question Paper

26th October 2019

(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**.
- 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) Briefly explain the role of “Troubleshooting” in Systems and Network Administration.

(4 marks)

ANSWER IN THIS BOX

- System failures are inevitable. It is the administrator’s job to play mechanic by diagnosing problems and calling in experts if needed.
- Finding the problem is often harder than fixing it.

- (b) Answer the following with regard to UNIX/Linux.

(i) What is meant by the GNU acronym?

(2 marks)

(ii) What is the difference between Linux and FreeBSD systems?

(2 marks)

ANSWER IN THIS BOX

(i) GNU is Not UNIX. It is a recursive acronym.

(ii) FreeBSD has similarities with Linux, with two major differences in scope and licensing: FreeBSD maintains a complete system, as opposed to Linux only delivering a kernel and drivers, and relying on third-parties for system software; and FreeBSD source code is generally released under a permissive BSD license, as opposed to the copyleft GPL used by Linux.

- (c) Manual pages or man pages provide on-line documentation in a Unix or UNIX-like system. Write down two (2) other tools that can be used as an alternative to the man pages tool. (2 marks)

ANSWER IN THIS BOX

- info pages tool
- bro pages tool
- cheat tool, tldr tool, or similar tools, even google

- (d) Linux file system implementations define seven types of files.
- (i) Write down the Linux commands that are required to create the following file types given in the answer box. (4 marks)
- (ii) What is the outcome of the following UNIX/Linux command executed by a user called Naduni Silva (with user name *nsilva*) who is in the *staff* group?
- ```
$ sudo chown -R nsilva:staff /home/backup/restore
```
- (3 marks)
- (iii) The **chgrp** command can be used to change the file's group ownership. What conditions need to be satisfied before applying the **chgrp** command? (2 marks)

**ANSWER IN THIS BOX**

(i)

| File Type         | Command to Create the file |
|-------------------|----------------------------|
| Regular File      | cp, editors, touch         |
| Directory         | Mkdir                      |
| Block Device File | Mknod                      |
| Symbolic Link     | ln -s                      |

- (ii) This will reset the owner and group of files restored (from a backup) for the user *nsilva* with group *staff*. Also, **-R** recursively changes the directory and all the files underneath it.
- (iii) To change a file's group, you must either be the owner of the file and belong to the group you're changing to or be the superuser.

- (e) What is the main task performed during the Bootstrapping process?

(3 marks)

**ANSWER IN THIS BOX**

During the main task of Bootstrapping process, the Kernel is loaded into memory and begins to execute it. A variety of initialization tasks are performed, and the system is then made available to users.

- (f)

- (i) Are Request for Comment (RFC) documents authoritative?

(1 mark)

- (ii) Provide an example of an RFC document indicating the assigned number and its purpose.

(2 marks)

**ANSWER IN THIS BOX**

(i) Yes, RFC document are absolutely authoritative documents.

(ii) RFC 791 – Internet Protocol (IP), or any one example of 8000 plus RFCs

- 2) (a) What is the main difference between the commands **su** and **sudo**, when logging in to the root account?

(4 marks)

**ANSWER IN THIS BOX**

The primary difference between the two is the password they require: while 'sudo' requires current user's password, 'su' requires you to enter the root user password.

- (b) The following questions are based on /etc/passwd file.

- (i) What is the main role of the /etc/passwd file in a Linux based system? (2 marks)
- (ii) It is not recommended to hold the encrypted password of a user in the /etc/passwd file. Briefly explain the reason(s) for the above fact and explain how encrypted user passwords are stored.

(2 marks)

**ANSWER IN THIS BOX**

- (i) The system consults the /etc/passwd file at login time to determine a user's UID and home directory along with other parameters. There are seven fields in the /etc/passwd file.
- (ii) If the user password exists in the /etc/passwd file, it is easy to decrypt the password since it is a world readable file. Now systems hide the encrypted passwords by placing them in a separate file that is not world readable. Because of this the /etc/passwd file contains an "x" in the relevant field.

(c) The following questions are based on managing Linux packages.

- (i) What is the outcome of the following RedHat based Linux command, if all the relevant dependencies related to the package below are installed?

```
rpm -U openssh-8.1p1-1.fc32.src.rpm
```

(2 marks)

- (ii) If the relevant dependencies for the above package in (i) were not installed, what is the new command one has to execute to achieve the required task?

(2 marks)

**ANSWER IN THIS BOX**

(i) This will upgrade the openssh old version with the above (8.1) version.

(ii) Since all dependencies for the above package starts with openssh- prefix, above command can be issued as follows.

```
rpm -U openssh-*
```

Or one can use yum command to achieve the above task.

```
yum upgrade openssh-8.1p1-1.fc32.src.rpm
```

(d)

- (i) What is the Linux command to create a hard link called **file.lnk** to an existing file called **file.org**?

(2 marks)

- (ii) What will happen to the content of **file.lnk**, if the **file.org** is deleted from the system?

(2 marks)

**ANSWER IN THIS BOX**

(i) \$ ln file.org file.lnk

(ii) Nothing will happen to the contents of file.lnk since it is a hard link.

(e) The following questions are based on RAID and Logical Volume Management.

- (i) What is the difference between RAID level 5 and RAID level 6 systems? **(2 marks)**
- (ii) Logical Volumes are preferred over disk partitions when allocating disk space for systems. Write down four (4) advantages one can gain by employing logical volumes instead of disk partitions. **(4 marks)**

**ANSWER IN THIS BOX**

(i) RAID level 6 is similar to RAID level 5 with two parity disks. A RAID level 6 array can withstand the complete failure of two drives without losing data.

(ii) Any of four from this list:

- Can move among different physical drives
- Grow and shrink logical volumes on the fly
- Take snapshots of logical volumes
- Replace on-line drives without interrupting service
- Incorporate mirroring/stripping in the logical volume

(f) Runaway processes that produce output can fill up an entire filesystem, causing numerous problems. When a file system fills up, a huge number of messages will be logged to the console and any attempt to write to the file system will produce error messages. Write down three (3) Linux commands that one can execute to troubleshoot such a situation. **(3 marks)**

**ANSWER IN THIS BOX**

- df -k command to analyse filesystem use
- du command to find which directories are using more space
- lsof command to determine which processes are using the file
- fuser command displays the process id of every process
- Other correct commands

- 3) (a) Assume you have a web server called bit.lk running in a different TCP port (79) than the default. You are given a command-line interface on another machine to check whether the webserver is accepting connections or not. What is your choice of command?

(2 marks)

**ANSWER IN THIS BOX**

telnet bit.lk 79

- (b) Explain the difference between URL and URN.

(4 marks)

**ANSWER IN THIS BOX**

URLs tell you how to locate a resource by describing its primary access mechanism e.g. http://localhost

URNs identify ("name") a resource without implying its location or telling you how to access it. E.g. ISBN

- (c) Write down five (5) basic components of a URL by using an example URL.

(6 marks)

**ANSWER IN THIS BOX**

http://www.bit.lk:79/results/semester6/IT6205.html

- Protocol – http://
- Hostname – www.bit.lk
- Port - 79
- Directory – results/semester6/
- Filename – IT6205.html



- (d) What is a dynamically shared module in Apache?

(2 marks)

**ANSWER IN THIS BOX**

A dynamically shared module can be load or unload using a configuration.

- (e) Explain the functionality of following Apache modules
- given in the answer box
- .

(6 marks)

**ANSWER IN THIS BOX**

| Module    | Functionality                                                            |
|-----------|--------------------------------------------------------------------------|
| rewrite   | Rewrites URLs with regular expressions                                   |
| mod_ssl   | Enable support for SSL for HTTPS                                         |
| autoindex | Displays the contents of directories that don't have a default HTML file |

- (f) What is virtual hosting on a web server?

(2 marks)

**ANSWER IN THIS BOX**

Single web server instance hosts multiple web sites

- (g) Explain the difference between name-based virtual hosting and IP based virtual hosting?  
(3 marks)

**ANSWER IN THIS BOX**

IP based virtual hosting distinguish each web site using unique IP address where name based virtual hosting will using different names all pointing to the same IP address

- 4) (a) The following questions are based on DNS configuration.

- (i) What is the suitable DNS record type for name-based web virtual hosting?  
(2 marks)
- (ii) Write down the required DNS resource records for the following scenario. The two sites **www.bit.cmb.ac.lk** and **www.vle.cmb.ac.lk** should be resolved to **202.10.10.5** IP address.  
(4 marks)
- (iii) Write down the functionality of the following parameters of an SOA record given in the answer box.  
(6 marks)

**ANSWER IN THIS BOX**

- (i) CNAME record type – single IP multiple names

(ii)

**www.bit.cmb.ac.lk.      IN      A      202.10.10.5**

**www.vle.cmb.ac.lk.      IN      CNAME      www.bit.cmb.ac.lk.**

Continued ...

(iii)

| SOA Parameter | Functionality                                              |
|---------------|------------------------------------------------------------|
| Minimum       | sets the time to live for negative answers that are cached |
| Retry         | Retry time if master DNS does not respond to slave         |
| Serial Number | used by slave servers to determine when to get fresh data  |

(b) Consider the following UNIX/Linux commands.

- (i) What is the outcome of the command below?  
`# ps aux`

(4 marks)

- (ii) What is the outcome of the following cron entry?  
`20 1 * * * find /tmp -atime +3 -type f -exec rm -f {} \;`

(4 marks)

**ANSWER IN THIS BOX**

- (i) This will show all processes, even if they do not have a control terminal, with a user oriented output format.

- (ii) This will run at 1:20 am each morning and removes all files in /tmp directory that have not been accessed in last 3 days.

- (c) What is meant by Full Virtualization? Briefly explain the role of Hypervisor in the context of full virtualization.

(5 marks)

**ANSWER IN THIS BOX**

Under Full Virtualization, the operating system is unaware that it is running on a virtualized platform. The hypervisor installed between the virtual machines and the hardware control the virtual environment.

The Hypervisor provides an emulation layer for all the host's hardware devices. Here the guest operating system will not be modified. Here the guest makes direct requests to the virtualized hardware and the Hypervisor handles them appropriately.

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