To be completed by the candidate

BIT Examination Index No: --

Important Instructions:

- The duration of the paper is **2 (Two) hours**.

- The medium of instruction and questions is English.

- This paper has **4 questions** and **10 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.

- **Non-programmable Calculators may be used.**

Questions Answered

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

To be completed by the candidate by marking a cross (×).	Question Numbers				
	1	2	3	4	
To be completed by the examiners:					

1) (a) Write down five (5) essential duties that are expected to be performed by a system administrator.

(5 marks)

ANSWER IN THIS BOX

Any five of the following.

- **Account provisioning.**
- **Adding/removing hardware**
- **Performing backup**
- **Installing & upgrading software**
- **Monitoring the system**
- **Troubleshooting**

(b) Answer the following questions with regard to UNIX, Linux and its distributions.

(i) Linux is generally referred to as GNU/Linux. What is the reason for this?

(ii) What is the main difference between the GPL and the BSD software licenses?

(6 marks)

ANSWER IN THIS BOX

(i) Linux is just the Kernel of the operating system and GNU project has built the related other utility and application software. So the whole package should be referred to as GNU/Linux.

(ii) GPL is an example of a copyleft Software license. This license is aimed at giving the end-user significant permission, such as permission to redistribute, reverse engineer, or otherwise modify the software.

Whereas the BSD license is a Permissive free software licenses, which essentially grant the end-user permission to do anything they wish with the source code.

(c) Manual pages or man pages provide on-line documentation in a Unix/Linux system. The man pages are divided into several sections. Write down three (3) such sections available in man pages **and** write down the man page command that will refer to a particular section of a command.

(5 marks)

> **ANSWER IN THIS BOX**
>
> **Section of man pages:**
>
> - **User-level commands**
>
> - **System calls/ Library calls**
>
> - **Standard file formats**
>
> **$ man - 5 passwd** ➔ **is an example that will refer section 5 of**
>
> **password document file (standard file formats)**

(d) Assume that a UNIX system administrator has lost a system's root password and the system is currently in the switched off state. Explain the steps that are needed to be taken by the system administrator to have control of the system without reinstalling it.

(4 marks)

> **ANSWER IN THIS BOX**
>
> **The system administrator should boot the system in single-user**
>
> **mode by giving the appropriate parameters at the boot time and reset**
>
> **the root password since single-user mode provide root shell after**
>
> **boot up.**

(e) Answer the following question with regard to shutting down a system.

 (i) Write down two (2) activities that are performed when a shutting down command is issued to a system?

 (ii) Write down the Unix/Linux command for shutting down the system in 15 minutes from executing the said command.

(5 marks)

> **ANSWER IN THIS BOX**
>
> **(i)   (a) Sends messages to the logged-in users**
>
> **(b) Runs file check-up activities**
>
> **(ii) $ shutdown –h +15**

2) (a) In order to bridge the gap between simplicity and security, Linux systems use an add-on tool called "**sudo**". Write down five (5) advantages that one can gain by using the sudo tool.

(5 marks)

ANSWER IN THIS BOX

    (i)   **The real root password will be known to few people only**

    (ii)   **Privileges can be revoked without the need of changing the root password**

    (iii)   **There is less chances of a root shell being left unattended.**

    (iv)   **A single file can be used to control access for an entire system.**

    (v)   **Accountability is possible via command logging.**

(b)
  (i) Most Unix/Linux variants use some form of package management system to facilitate the task of software update management. Write down three (3) package management tools available in such systems.

  (ii) While being a system administrator managing hundreds of Linux machines it is not possible to update each machine individually and directly using the tools mentioned in (b)(i). Explain an alternative method to handle a situation where it is needed to update the software of all machines.

(6 marks)

ANSWER IN THIS BOX

    (i)   **rpm tools**

           yum

           apt-get

    (ii)   **You need to create a local repository mirror by downloading a copy of the package management system. It is easy to configure a local mirror and can save the Internet bandwidth as well. If you are using apt-get tool you can configure an apt-mirror package.**

(c) Following is a line in the output of "*ls –l*" command executed on "*/home/saman*" directory.

```
-rwxrwxr-x 1 saman staff 552 2013-08-01 11:55 CV.doc
```

 (i) Write down the UNIX command to create a hard link called "my-CV.doc" to the file "CV.doc" in the /home/saman/resume directory.
 (ii) Write down the UNIX command to change the current file permission of the "CV.doc" file to: user (read and write), group (read only) and other/world (none).
 (iii) Write down the UNIX command to set the *setgid* bit of the "CV.doc" file.
 (iv) We can set the default permission of a file using the *umask* command. How can we set the default umask value for a user on his/her login?

(8 marks)

ANSWER IN THIS BOX

    (i)   **ln ../CV.doc my-CV.doc**

    (ii)   **chmod 640 my-CV.doc**

    (iii)   **chmod g+s my-CV.doc**

    (iv)   **we can set the required umask value in the .profile of the user.**

(d)
 (i) Linux will support ext2 and ext3 file system types. What is the main difference between the two file system types?
 (ii) Redundant Array of Inexpensive Disks (RAID) is a system that distributes or replicates data across multiple disks. Briefly explain what is meant by a reliability of RAID level 5 emphasising its space utilisation properties.

(**6 marks**)

ANSWER IN THIS BOX

    (i)   **The ext3 file system type adds journaling capability to the existing ext2 type. The ext3 extension is implemented without changing the fundamental structure of ext2.**

    (ii)   **RAID Level 5 strips both data and parity, adding redundancy while simultaneously improve tread performance. If there are n drives in an array, n-1 of them can store data. The space efficiency of RAID level 5 is at least 67%.**

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3) (a) A computer with CentOS operating system has been configured with the required IP interface details.

    (i) Write down the Linux command (in the terminal mode) to add a new route to the **192.168.1.0/24** network through the gateway router **cmb-gw.cmb.ac.lk**, which is connected to the local network directly.

    (ii) The Dynamic Host Configuration Protocol (DHCP) will activate an IP interface of a host automatically on lease. Write down three (3) parameters that will be provided through such a lease.

(4 marks)

ANSWER IN THIS BOX

    (i)   **route add –net 192.168.1.0/24 cmb-gw.cmb.ac.lk**

    (ii)   **IP address and its netmask**

        Default Gateway

        DNS Server

(b) The following questions are based on the domain name server (DNS) concepts.

    (i) What is meant by a DNS iterative (or non-recursive) query?

    (ii) What is meant by a zone in the DNS context?

    (iii) How do we start defining resource records for a zone?

(6 marks)

ANSWER IN THIS BOX

    (i)   **When the name server of a host cannot resolve a query, it sends a referral to another server to the resolver.**

    (ii)   **A DNS zone refers to a certain portion or administrative space within the global Domain Name System. Each DNS zone represents a boundary of authority subject to management by certain entities and is administered as a single separate entity.**

    (iii)   **With the Start of Authority (SOA) record.**

(c) An apache web server is to be configured for a web hosting company. This web server needs to be configured/modified to host two sites with name-based virtual hosting with the IP address 192.220.10.15 and one site with IP-based virtual hosting with the IP address 192.220.10.25. Explain the configuration required for these sites with the following additional data (site name and its document path).

Site 1 – Name-based	Site 2 – Name-based	Site 3 – IP-based
www.site1.lk	www.site2.lk	www.site3.lk
/var/www/htdocs/site1	/var/www/htdocs/site2	/var/www/htdocs/site3

(6 marks)

ANSWER IN THIS BOX

Need to configure name-based and IP-based virtual hosting together.

NameVirtualHost   192.220.10.15

<VirtualHost 192.220.10.15>

ServerName   www.site1.lk

DocumentRoot /var/www/htdocs/site1

</VirtualHost>

<VirtualHost 192.220.10.15>

ServerName   www.site2.lk

DocumentRoot /var/www/htdocs/site2

</VirtualHost>

<VirtualHost 192.220.10.25>

ServerName   www.site3.lk

DocumentRoot /var/www/htdocs/site3

</VirtualHost>

(d) Write down three (3) components of a mail server.

(3 marks)

ANSWER IN THIS BOX

- **Mail User Agent (MUA)**

- **Mail Transport Agent (MTA)**

- **Domain Name Server (DNS)**

(e) Answer the following with regard to a Squid caching server configuration, for an organisation.

    (i) Assume that a request for a caching server is a "**hit**". Can the server provide the cached entity directly to the client? Justify your answer.

    (ii) Consider the following Access Control List (ACL) entries. Note that the organisation's Finance department IPs are 192.220.35.0/24 and Sales department IPs are 192.220.45.0/24 respectively.

```
http_access   allow   Finance-Dpet
http_access   allow   Sales-Dept
http_access   deny    all
```

    In order to complete the above access control, what other entries are required to be configured?

    (iii) Can the order of the above three allow/deny rules be changed? Justify your answer.

(6 marks)

ANSWER IN THIS BOX

(i) If the cached item is a fresh copy, It will be given directly. If it is a stale copy, it needs to be validated before giving to the user even though it's a hit.

(ii) We need to define the ACL staements.

ACL Finance-Dept   src   192.220.35.0/24

ACL Sales-Dept   src   192.220.45.0/24

ACL   ALL   src   0/0

(iii) No.

Assume id of the last entry will be changed to first allow/deny rule. Then everyone will be blocked even though Finance department or Sales department have access.

4) (a) In Linux, scheduled routine tasks can be automated using "cron" utility.
   (i) What is the format of the crontab file?

   (ii) What does the following command supposed to perform?
   ```
   crontab -e
   ```

   (4 marks)

   ANSWER IN THIS BOX

   (i) **Each non-commented line contains six fields and represents one command. The six fields contain:**

   Minute, Hour, Day of Month, Month, Weekday and command

   (ii) **It checks out a copy of your crontab, invokes your editor on it and resubmits it to the crontab directory.**

   (b) Answer the following with regard to shell scripting.

   (i) The first line of a shell script contains what is known as the "shebang" statement. What is the purpose of this line?

   (ii) Write a bash shell script to copy all the files ending with *.sh* in the current directory with *.sh-backup* extension. When copying each file, a message should be displayed on the screen saying "Copying file:" along with the name of the appropriate file.

   (6 marks)

   ANSWER IN THIS BOX

   (i) **The shebang will be something like /bin/bash. This is included because the kernel looks for syntax when deciding how to execute the file. From the shell scripting perspective it is just a comment line.**

   (ii) **# /bn/bash**

   for files in *.sh;

   do

   Echo "Copying file: $files "

   cp $files $files-backup

   done

(c) Explain the functionality of each of the following commands in Unix.

    (i) `cut –d: -f7 /etc/passwd | sort | uniq -c`

(5 marks)

ANSWER IN THIS BOX

This will give the number of different types of login shells that are in the /etc/passwd file along with its count. For example:

4 /bin/bash

7 /sbin/nologin

    (ii) `$ echo "IT6204 Paper 2013" >> /tmp/bit`

(5 marks)

ANSWER IN THIS BOX

"IT6204 Paper 2013" string will be appended to last line of the file called bit in the /tmp directory.

(d) Write down five (5) benefits of virtualization as used in cloud computing.

(5 marks)

ANSWER IN THIS BOX

1. **Cost saving**

2. **Reduced energy use**

3. **Simplified business continuity**

4. **Increased availability**

5. **Greater technical agility**

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