Sri Lanka Institute of Information Technology

B.Sc. Honours Degree in Information Technology

Specialized in Computer Systems and Network Engineering

Final Examination
Year 3, Semester 2 (2022)

IE2060 – Computer Systems Administration

Duration: 2 Hours

November 2022

Instructions to Candidates:

- This paper has 4 questions.
- Answer all questions in the booklet given.
- The total marks for the paper is 100.
- This paper contains 7 pages, including the cover page.
- Electronic devices capable of storing and retrieving text, including calculators and mobile phones are not allowed.
- This paper is proceeded with 10 minutes of reading time, commenced at the beginning of the examination.

Question 1 (35 Marks)

You are the newly appointed systems engineer of Ravimal Apparels Pvt. Ltd., which is an apparel company manufacturing and exporting quality apparel items to a number of foreign countries and distributors to a number of retail companies in Sri Lanka. The company is in the process of upgrading its existing local network as well as establishing a new branch of the company for fashion design. The current existing network is running the Linux operating system of kernel version 5.3.18 and only the Head Office (Biyagama) which is a four stored building with 3 departments with 20+ hosts each and an executive staff office with 10+ hosts, is connected to the domain environment with the domain name ravimal.lk. There are three manufacturing plants situated in three BOI zones in the country and each plant consists of a material development facility (20+ hosts), manufacturing facility (10+ hosts), control office (5+ hosts), and services office (2+ hosts). There will be a new fashion designing branch (20+ hosts) included in the network which will be based in Colombo. All these isolated networks should be connected to the same domain and proper, secured communication methods should be established. Each office or department will include a printer and fax machine. The current network uses the private IP range 172.16.11.0/24 and two public IP address 10.205.113.67 and 201.31.54.3 which is connected via two leased lines to the internet service provider. The fashion designing unit needs storage space and backup capabilities for their workflow preferably in the cloud space and these tasks should be automated. The company is hoping to launch its own online apparel site including its own fashion manufacturing line.

a. Identify **five (5)** important aspects of the network that should be upgraded or introduced based on the above scenario. (5 marks)

b. Compute an **IP addressing scheme** for the head office (Biyagama) and define the IP address, and subnet mask for the following components. Copy the following table 1. structure your answer sheet and fill-in the content. (7 marks)

Table 1 – IP plan for the Head Office (Biyagama)

Server	IP address	Subnet mask	Default gateway	DNS address
DNS server 1				
DNS server 2				
Web server				
Printer server				
Gateway server				
File server				
DHCP server				

c. The network administrator needs to configure the Local DNS Server with a forward lookup and a reverse lookup zone for the records listed following.

- **NS** record for the name server in the network
- **MX** record for the mail server in the network
- **A** record for the web server in the network

Complete the DNS entries as needed marked by the line numbers **L1,L2,L3,L4,L5,L6,L7,L8,L9,L10,L11**. You need to use the information given in the description and the IP addresses assigned in part B) to complete the zone information. (Copy the two partially created lookup zone files (Figure 1.1 and Figure 1.2) to your answer booklet to)

(11 marks)

forward.csa.lk

```
$TTL 86400
@ IN      SOA   dns.csa.lk.      root.csa.lk. (
<<Student Registration Number>>          ; L1
<<Student Birth Year>>          ; L2
1800      ;
604800          ;
86400     ) ;

;L3 DNS connection mapping entry
;L4 web server mapping entry
;L5 mail server mapping entry
```

Figure 1.1. Forward Lookup zone information

reverse.csa.lk

```
$TTL 86400
@ IN      SOA   dns.csa.lk.      root.csa.lk. (
<<Student Registration Number>>          ; L6
<<Student Birth Year>>          ; L7
1800      ;
604800          ;
86400     ) ;

; L8 DNS connection mapping entry
; L9domain pointer mapping entry
; L10web server pointer mapping entry
; L11mail server pointer mapping entry
```

Figure 1.2. Reverse Lookup zone information

d. Assume that the DNS server is running in the domain controller of the network and you as the system administrator runs different tasks on the operating system.

i. Write a shell script to automatically create Users by providing the ***user name*** and ***password*** via command line arguments. The user password must expire at the first login. (3 marks)

ii. Modify the ***/etc/crontab*** file to generate a corn schedule to copy the fashion folder content hosted in the filed server to the cloud. The corn job should be executed every weekend at **00.02 PM**, in every month, by the root user. Note that the script name and the file server location must be defined by the system engineer.

(4 marks)

e. Determine the naming convention for new users at the domain ***ravimal.lk***.

(5 Marks)

Question 2 (25 Marks)

a. Identify is the usage of "**sudo**" command in Linux. (2 marks)

b. Name and describe 3 types of Special-purpose access modes in Linux (6 marks)

c. Describe the steps to add a normal user as a root user. (5 marks)

d. Explain the usage of" **X**" access type with reference to Linux file permission. (2 marks)

e. Distinguish is the purpose of the shadow password file. (2 marks)

f. List the steps needed to add a user to a system without using the **useradd** program. (Clearly mention the extra steps needed for a particular local environment.). (5 marks)

g. Why shouldn't a Linux system be turned off with the power button on the computer case? (3 marks)

Question 3 (20 Marks)

a. Describe the three components that the kernel needs to know about, whenever the Linux kernel needs to conduct an I/O operation to one of the system storage devices. (3 marks)

b. Interpret the following grub file. (8 marks)

```
default=0

timeout=5

splashimage=(hd0,2)/boot/grub/splash.xpm.gz

hiddenmenu

title Windows XP

rootnoverify (hd0,0)

chainloader +1

title Red Hat

root (hd0,1)

kernel /boot/vmlinuz

title Fedora

root (hd0,2)

kernel /boot/vmlinuz
```

c. Suppose a system engineer discovers that a certain feature of **Apache httpd** does not appear to work as documented on Ubuntu.

i. Name the action to carry out before reporting the bug? (2 marks)

ii. Interpret the method of notification and the authority when the reported bug is the real issue behind the event. (3 marks)

iii. Distinguish the information to be included in the bug report. (4 marks)

Question 4 (20 Marks)

a. Compare the characteristics of the Iterative server and Concurrent server. (4 marks)

b. Describe the importance of a proxy server in a network. (5 marks)

c. As the System Engineer for the Ravimal (PVT) Limited you have been asked to configure DHCP service within the ravimal.lk domain for the abc.ravimal.lk server. The domain is granted with the 172.16.11.0/24 network address. The available next 100 addresses should be allocated via a DHCP pool after the following allocation of Ip addresses.

Default gateway = Take the IP address provided in Question 1 part b.

DNS server = Take the IP address provided in Question 1 part b.

DHCP server = Take the IP address provided in Question 1 part b.

d. Modify the following code file lines numbered **1,2,3,4,5,6,7,8,9** which is the *dhcpd.conf* sample file to configure the dhcp service for the Ravimal company requirement mentioned above. (11 marks)

Some of the important components are highlighted.

```
# cat /usr/share/doc/dhcp*/dhcpd.conf.sample
# dhcpd.conf

# option definitions common to all supported networks...
option domain-name "example.org"; #1
option domain-name-servers ns1.example.org; #2

default-lease-time 600;
max-lease-time 7200;

# If this DHCP server is the official DHCP server for the local
# network, the authoritative directive should be uncommented.

#authoritative; #3


subnet 10.5.5.0 netmask 255.255.255.224 { #4
  range 10.5.5.26 10.5.5.30; #5
  option domain-name-servers ns1.internal.example.org; #6
  option domain-name "internal.example.org"; #7
  option routers 10.5.5.1; #8
  option broadcast-address 10.5.5.31; #9
  default-lease-time 600;
  max-lease-time 7200;
}
```