University of Jaffna, Sri Lanka

Bachelor of Science Honours in Computer Science - Level 4M - 2021

Bachelor of Science Honours in Computer Science - Level 4S - 2021

CSC405S3/CSC405M3: Systems and Network Administration

Answer All Questions

This paper has 2 questions in a total of 3 pages

Time allowed: 3 Hours

Notes:

- Read all the questions carefully before you start answering.
- You are permitted to use ONLY your materials. No websites can be accessed.

Part 1

Notes:

- Read the questions carefully. Some of the answers need to be written in the sheets given to you.
- You are free to make any reasonable assumptions. However, you must justify your assumptions and write them down in a readme file.
- You can use either dynamic or static routing to enable network communication.
- You need to submit the following for this Part 1 as a zip/tar file — name the zip/tar file with your registration number (e.g., 2050CSC000.zip):
  - The Readme file includes all the commands you used to configure switches and routers and the assumptions you made.
  - Cisco Packet Tracer file consisting of your network model and configurations — this must be named with your registration number (e.g., 2050CSC000.pkt).

1. The University of Kalvi wants to restructure its network infrastructure. It has the following requirements:

   - It has two campuses that are geographically located in two distant locations that are connected via a WAN connection.
   - Each of these campuses has two faculties, and each faculty has three departments. You can name each entity as you wish, for instance, Campus-1, Faculty-1, Department-A, etc.
   - Students in each faculty should be able to communicate among themselves. However, they should not be able to communicate with other faculties through the network.
   - The academic staff of each department should be able to communicate among themselves only.

[Question 1 continues ...]

- The administrative staff should be able to communicate among themselves at the University level. The administrative staff of a particular faculty should be able to communicate with the administrative staff of all other faculties.
- Each department has 100 students, 10 academic and 5 administrative staff. The University also has a Network Operating Centre (NOC) that consists of a Web server, Email Server, Proxy server, and DNS server, and all these services should be able to be reached by everyone in the University.
- Each faculty has its DHCP server to issue IP addresses for students. Since Staff computers are fixed, IP addresses are manually assigned.

(a) Draw a high-level diagram based on the requirements to show the network design of the University on the given sheet by clearly showing the required routers, switches, servers, and network connectivity. You also need to include one PC in each network. [20%]

(b) Make an efficient IP plan according to the given requirements and write the network addresses in the given sheets according to the following format:
Campus:Faculty:Department:Staff-type/Student-NetworkAddress
for instance, Campus:Faculty:Department:Admin-Staff:10.10.10.0/24. [20%]

(c) Model the proposed network using Cisco Packet Tracer. [20%]

(d) Configure all switches and routers via CLI. You need to copy all your commands to the readme file. [40%]

Part 2

Notes:

- Read the questions carefully.
- You need to create a directory, include the following files, compress the folder to tar.gz format and upload it — name the tar.gz file should be your registration number:
  - All the configuration files and all other files we need to reproduce what you have implemented.
  - A text file (commands.txt) consists of all the commands you used to perform the given tasks. The commands need to be numbered correctly.
  - A readme file consisting of assumptions, if any.
  - The readme files should also include steps to run the servers using configuration files. For instance, where to copy your configuration and other files, which files need to be modified, how to run servers, etc.

2. The University of Kalvi wants to set up a Web server, DNS server, and Proxy server according to the following specifications:

(a) Set up a web server according to the following specifications: [30%

- The University wants to host three websites on a computer that can be accessed using the following three domain names: www.kalvi.ac.lk, www.fac1.kalvi.ac.lk, and www.fac2.kalvi.ac.lk.
- Administrators want to track the errors of these websites in separate error files.
- These domains should be able to be accessed with and without 'www' label.

(b) Set up a DNS server according to the following specifications: [40%

- The University wants to set up a DNS server to resolve its domain locally, and it wants to forward the request to LEARN's DNS server —192.248.1.161 — to resolve external domain names.
- Website domains considered in the web server must be resolved with and without 'www' labels.
- The University has only one email server, the IP address is 192.248.56.4, and the email domain is mail.kalvi.ac.lk.
- This DNS server can only be used by the users within the University.

(c) Set up a Proxy server according to the following specifications: [20%

- The University does not want staff to access the following social media sites: www.facebook.co and www.twitter.com during office hours — from 08:00 to 17:00.
- The University wants to allow only FTP, SMTP, HTTP and HTTPS services through the proxy server.

(d) The University of Kalvi wants to set up a regular backup service for backing up its websites. Write a script and create a cron job to do the regular backup according to the following requirements: [10%]

- The University wants to back up all the websites every day at 11 pm.
- All the documentroot folders need to be compressed and copied to a folder called backup in the /opt directory.
- The compressed file needs to be named with the date of the particular day — for instance, backup-20230302.tar.gz.

End