GHANA COMMUNICATION TECHNOLOGY UNIVERSITY

FACULTY OF COMPUTING AND INFORMATION SYSTEMS

BACHELOR OF INFORMATION TECHNOLOGY (LEVEL 400)

TOP UP (EVENING/WEEKEND)

END-OF-SEMESTER EXAMINATIONS: 13th November 2022

Course Code: IT-412

COURSE TITLE: Systems Administration

Duration: 3 hours

[Instructions to students]

This paper consists of two parts: Part **A** (60 marks) and Part **B** (40 marks). Part A is mandatory questions. Part B comprises three (3) questions, where the student is required to choose only two (2) questions. Note that five (5) marks could be awarded for good expression and orderly presentation of answers.

PART A (Application) 60 MARKS

This Part A consists of two (2) case studies. The objective is to understand how knowledge gain can be applied to different scenarios. Thus, the student is required to attempt all questions where each carry 30 marks.

Question 1

CASE STUDY: Seven People, One Command Line Sysadmin (30 Marks)

Mr. Amponsah is a System Administrator assigned to create a new web server on a machine outside their corporate firewall that connect it to an authentication server inside the firewall on one of their customer accounts he supported. His manager sent detailed instructions for the process, which included sample commands for over twenty steps to be performed under a very tight deadline. The first few steps for creating the new web server appeared to go well but configuring the authentication server to work with the new web server produced a vague error message: "Error: Could not connect to server."

For the next few hours, Amponsah was involved in increasingly intense troubleshooting. Through telephone, e-mail, instant messaging, and in-person conversations, he worked with seven different people, including his manager, the network team, his office mate, the architect of the system, a technical support person, a colleague, and a software developer. Each asked him questions about system behavior, entries in log and configuration files, error codes, and so on, and each suggested command to run. Each sought his attention and trust, competing for the right to tell him what to do.

We refer to this collaboration pattern as "Seven People, One Command Line," as various people participated in troubleshooting, but only Amponsah had access to the troubled system. His manager wanted to know when the problem would be fixed and whether others should be redirected to help him complete the task on time. The support person wanted to resolve the problem ticket and end the call as quickly as possible. His colleague wanted to help within the limitations imposed by his own responsibilities. The system architect wanted to know if there was any problem in the overall design without being mired in the details. Other specialists waited for instructions to manipulate the subsystems they were responsible for. Figure 1 below is a diagram that shows the interaction between Amponsah with different individuals or groups using various means of communication.

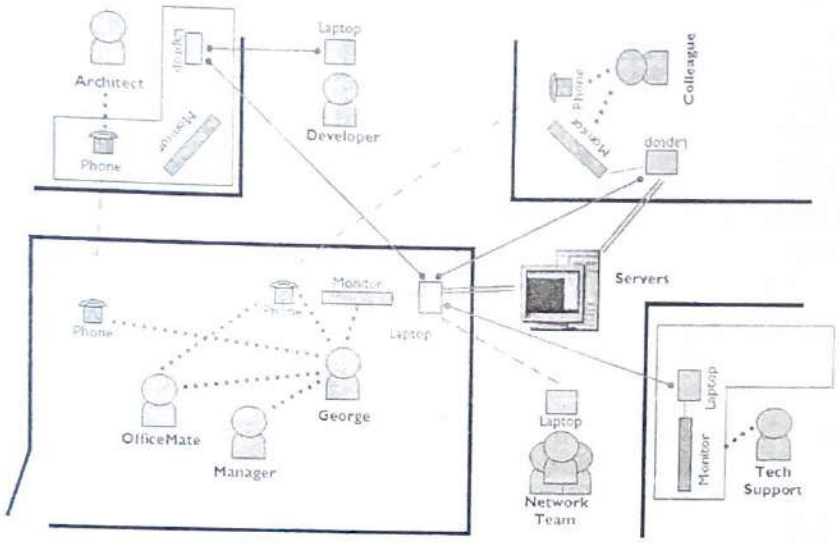

Figure 1: Amponsah interacting with different groups and individual

In this figure 1, instant message communication is shown in single solid lines; e-mail communication in dashed lines; phone conversations in dotted and-dashed lines; and face-to-face communication in dotted lines. The double solid line is access to the problematic server, which only Amponsah and his colleague had during the session.

The problem was eventually found to be a network misconfiguration. Amponsah misunderstood the meaning of a certain configuration parameter for the new web server (ambiguously labeled as "port") to be for communication from the webserver to the authentication server, when in fact it was the opposite. The former would have been permitted by the firewall, but the latter was not.

Amponsah's misunderstanding affected the remote collaborators significantly throughout the troubleshooting session. We witnessed several instances in which he ignored or misinterpreted evidence of the real problem, filtering what he communicated by his incorrect understanding of the system configuration, which in turn greatly limited his collaborators' ability to understand the problem. Amponsah's error propagated to his collaborators. The solution was finally found by the one collaborator who had independent access to the systems, which meant his view of the systems was not contaminated by Amponsah's incorrect understanding.

i. The challenges experienced by Amponsah as a systems administrator are not different from those experienced in the contemporary world of work, in terms of managing system risk, and complexity in a network environment. Briefly explain one way to manage the risks and system complexities. **(5 Marks)**

ii. Though Amponsah appears to be satisfied with the administrative tools that support his work, there seems to be a problem with the administrative tool. Given your understanding of this case question and your knowledge of systems administration, identify the problem with the tools. **(5 Marks)**

iii. Briefly explain "Namespace" and mention four (4) possible kinds of namespace that can be utilized by Amponsah to avoid parameter misconfiguration such as the one relating to ambiguous labelling as "port". **(6 Marks)**

iv. Explain briefly to Amponsah the relevance of having an "Open Architecture" to support services on their network. **(5 Marks)**

v. Paragraph 3 of this case question stated "Seven People, One Command Line" which may suggest a Secure Single Sign-on (SSO) method. In this regard, briefly state the four (4) components of SSO. **(4 Mark)**

vi. What would you consider the main issue in this case study question? **(5 Mark)**

Question 2

CASE STUDY: SIM REGISTRATION AND RE-REGISTRATION (30 Marks)

The National Identification Authority (NIA) in conjunction with the National Communication Authority (NCA) is carrying out SIM registration and re-registration. Various reasons have been given for the need for SIM registration which include:

- Secure your SIM and stay connected
- Secure SIM card-based transactions and curb fraudulent and criminal activities
- For the network operators, the SIM exercise enables them to build better demographics of their customer base and help them develop products and services to suit the various groupings in Ghana
- For the regulator, National Communication Authority (NCA), will depend on the statistics generated by the data to regulate the industry well
- On the economic front, SIM registration will enhance economic growth and gradually formalize the informal sector as people will now be able to access E-Government services and other private e-services. Additionally, SIM registration will support financial inclusion across vulnerable sectors.

Currently, SIM re-registration has been very challenging, in which various reasons have been given for the need for SIM re-registration which include:

1. ID verification of people because of the recorded fake ID numbers as well as fictitious names for the existing SIM registration databases.
2. Pre-registered SIM cards-There is an issue of non-verification of IDs which allowed some SIM card vendors to register SIMs before selling them. Consequently, SIM was already activated before it is sold to the prospective user.

Other frequently asked question includes:

- What happens to inactive SIM cards

- What data will be used for
- Who keeps the data

Ghanaians without Ghana Cards are required to register for Ghana Card because it serves as the only official document for SIM re-registration. Recently, the NCA issues a press release to announce imminent service interruptions for unregistered SIMs which affect the majority of people including those outside Ghana. So, to register a SIM, one must:

- Obtain a Ghana card through the National Identification Authority (NIA).
- Complete an initial self-registration by linking the Ghana card number through a short code by phone.
- Personally visit the office of their mobile network operator with the Ghana card to capture biometric data on a computer. Alternatively, a self-service application is available on the Google Play store for the public to use.

Unfortunately, the Ghana Card registration centers have recorded long queues leading to delays in receiving Ghana Cards and subsequently delaying SIM re-registration.

a) From this case, it may be seen that remote access can be achieved in many ways, identify and explain briefly the two (2) main ways or categories of remote access. **(10 Marks)**

b) As a Systems Administrator, one of your main concerns is to provide a reliable service to users. Identify and briefly explain two (2) types of service monitoring approaches that can be implemented. **(10 Marks)**

c) Identify and briefly explain three (2) technical challenges associated with monitoring web services. **(10 Marks)**

PART B (Theory and Knowledge) 40 MARKS

Attempt only two (2) from this section. Each question carries 20 marks.

Question 3

a) Discuss the difference between Pluggable Authentication Module (PAM) and Naming Service Switch (NSS). **(10 Marks)**

b) Briefly explain the following terms:

i. Data integrity **(5 Marks)**

ii. Security policy **(5 Marks)**

Question 4

a) When multiple machines or computers are involved in web service, scaling web services can be achieved in two (2) ways or methods. State and explain the two (2) approaches to scaling. **(10 Marks)**

b) What is a wins server? **(5 Marks)**

c) What is the Windows Registry? **(5 Marks)**

Question 5

a. State and discuss the four (4) models that constitutes the LDAP. **(8 Marks)**
b. What is "software depot services"? **(4 Marks)**
c. State and explain briefly the three (3) forms of windows software depots. **(6 Marks)**
d. State and explain briefly one (1) global web services monitoring tool. **(2 Marks)**

----------End of question----------