QUESTIONS

Question 1

Guaranty Bank Plc is desirous of having a secure communication with its branches and the HQ located in Lagos. The HQ is a twenty storey building complete with Conference rooms and sundry. The bank has about 50 branches in Lagos. There is a need for 100 X 20 = 2,000 points at the HQ. The bank has branches in every state of the federation with about 30 branches across each state. Each branch needs about 100 networking points. The bank will need to do SECURE real time online banking in its branches across the country. The bank also has branches in Ghana, The Gambia, Sierra Leone, the UK and one in the United States. The bank has ATM at every branch and additional networks of ATM all over the country. Design an appropriate platform for banking and other communication services including voice and video communications **(20 marks).**

Please state clearly the assumptions that will help you solve this problem.

(a) Design a network to interconnect the banks to allow for adequate communication services.

(b)

(i) Discuss with illustrations your design strategy.
(ii) If possible implement Cisco Hierarchical network design model
(iii) Indicate your addressing scheme.
(iv) State clearly the network requirement in achieving your network design
(v) Mention and explain why your choice of an IP address scheme in your network design is suitable for the problem at hand.
(vi) Give detail of how to achieve secure communication over this network**.**
(vii) Network Downtime is a serious challenge over any network, how would you mitigate this problem.
(viii) Which routing protocol did you implement. Show the syntax**.**

2 a. Discuss the technologies and services of Cloud Computing. **(5 marks).**

b. Discuss Code Division Multiplexing (CDMA) implementation in a cellular network, illustrate sender and receiver encoding with appropriate diagrams **(3 marks)**.

c. Discuss Carrier Sense Multiple Access with Collision Avoidance (CSMA/CA) as implemented in wireless networks **(3 marks).**

d. Compare and Contrast between Frequency Division Multiplexing, Time Division Multiplexing, and Wave division multiplexing. Illustrate with diagrams. **(4 marks)**

e. Discuss with appropriate illustration the structure and architecture (3G) GSM cellular network. Compare and Contrast between 3G, 4G and 5G networks **(5 marks).**

3. a. What is network security? What are the risks a typical network face? **(3 marks)**

b. Differentiate between Symmetric Key Cryptography and Public Key Cryptography. Illustrate with examples. How can a 'man in the middle' attack be militated against? **(4 marks)**

c. Discuss ways and means by which two friends – say Emeka and Cynthia can secure their email communications. **(4 marks)**

d. Discuss the components of Storage Area Networks and how such systems can be secured. (**5 marks)**

e. Discuss Internet security Threats and possible countermeasures. **(4 marks).**

4. a. Compare and contrast between OSI model and TCP/IP layered architecture. Illustrate with diagrams**(4 marks)**

b. With appropriate illustrations discuss the structure of the Internet **(4 marks)**.

c. Compare and Contrast between Frame relay and Asynchronous Transfer Mode (ATM)**(4 marks)**

d. Discuss Wireless radio propagation by ground wave, Sky wave and Line of sight (illustrate with diagrams). What is the difference between Terrestrial Microwave and Satellite microwave **(4 marks)**.

e. Compare and Contrast between Circuit switching, Packet Switching **(4 marks)**.

5. a. Discuss **Odd Parity and cyclic redundancy check (CRC)** and use these concepts to illustrate error detection and error correction within the data link layer of the OSI model.**(4 marks)**

b. Compare and contrast the following channel access methodologies; S-ALOHA, CSMA/CD, Taking Turns. **(5 marks).**

c. Differentiate between Routing and forwarding and illustrate with examples. List the advantages of Fibre Optic cables (FOC) over Unshielded Twisted Pair. **(4 marks)**

d. Discuss the use of Maximum Transfer Size (MTU) in IP fragmentation and Assembly. **(4 marks)**

e. Discuss the use of different tiers of switches and Routers in a modern data center. Illustrate with appropriate diagrams **(3 marks).**

6. a. Write **Dijkstra's** algorithm? **Using Dijkstra's** algorithm determine shortest path from **u** to **z** in the network diagram shown in Figure 6a. **(4 marks)**

Fig 6a

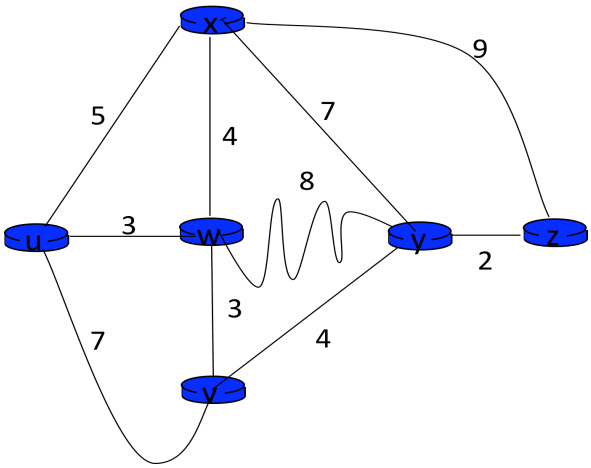
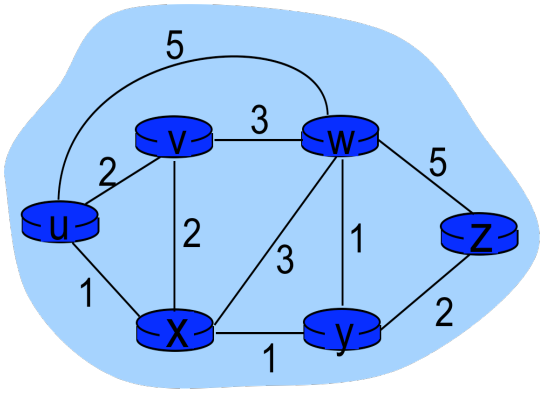


Fig 6b



b. Using Distance vector algorithm (Bellman-Ford example) determines the shortest path in Figure 5b. Please show all the steps leading to a shortest path. **(4 marks)**.

c. Explain how a packet is transmitted in **Virtual Circuits** and **Datagram Networks**. Illustrate with diagrams. **(4 marks).**

d. Discuss the networking technology implemented by ISPs that allows the use of one IP address by an organization? Illustrate with diagrams. **(4 marks)**

e. Discuss how **ipv4** and **ipv6** based routers can be used in an enterprise network. Illustrate with diagrams **(4 marks)**

7. a. Discuss the differences between the UDP and TCP protocols of the Transport Layer. Illustrate with diagrams**.(4 marks)**

b. Explain how UDP Checksum is used for error detection in the Transport layer. Given the following 16 bit words, find the value that would be in the Checksum field of the UDP segment. **(4 marks)**

0110011001100001
0101010111010101
1001011011001001
1000111100001100

c. Differentiate between Transport and Network layer services**.(4 marks)**

d. Discuss Multiplexing and De-multiplexing services of the Transport Layer**. (4 marks)**

e. Differentiate between flow control and congestion control services in a TCP Layer**.(4 marks)**