2920/301
DATA COMMUNICATION
AND NETWORKING
November 2021
Time: 3 Hours

THE KENYA NATIONAL EXAMINATIONS COUNCIL

DIPLOMA IN INFORMATION COMMUNICATION TECHNOLOGY

MODULE III

DATA COMMUNICATION AND NETWORKING

3 hours

INSTRUCTIONS TO CANDIDATES

*This paper consists of **EIGHT** questions.*
*Answer any **FIVE** of the **EIGHT** questions in the answer booklet provided.*
Candidates should answer the questions in English.

This paper consists of 4 printed pages.

Candidates should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing.

Turn over

1. (a) Differentiate between *analog* and *digital* signals as used in data communication. (4 marks)

(b) Explain **three** functions of physical layer in OSI model. (6 marks)

(c) User Datagram Protocol header is made up of several fields. Explain **three** fields that could be found in the header. (6 marks)

(d) Mary intends to use command line network operating system for her computer network. Outline **four** advantages of the operating system that could have influenced her choice. (4 marks)

2. (a) Outline **four** types of communication software that could be found in a computer. (4 marks)

(b) For each of the following scenarios, suggest the most appropriate Internet connection justifying your answer:

(i) a host server that is accessed by millions of users; (1 mark)

(ii) a home office that uses existing telephone lines; (1 mark)

(iii) a video chat on a mobile phone; (1 mark)

(iv) connecting several branches of company located in various towns. (1 mark)

(c) (i) Outline **two** uses of a network baseline during network troubleshooting. (2 marks)

(ii) Unipolar encoding scheme has several problems that makes it unpopular in modern digital transmission schemes. Explain **two** such problems. (4 marks)

(d) (i) Outline **two** roles of Simple Mail Transfer Protocol (SMTP). (2 marks)

(ii) Figure 1 shows a copper twisted pair cable (STP). Use it to answer the question that follows:

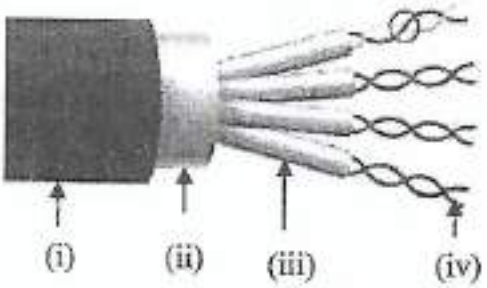

Figure 1

Outline the functions of the part labelled (i), (ii), (iii) and (iv). (4 marks)

3. (a) Describe **three** organizations that regulates WLAN. (6 marks)

(b) Kate designed a computer network that used hybrid network topology. Outline **four** factors that could have influenced her design. (4 marks)

(c) Differentiate between *next- generation firewall* and *cloud firewall*. (4 marks)

(d) Dynamic Host Configuration Protocol (DHCP) is used to automate IP addressing in a network. Explain **three** components of this protocol. (6 marks)

4. (a) Explain each of the following terms as used in the Internet:

(i) attachment; (2 marks)

(ii) favourite. (2 marks)

(b) Peter was advised by his friend to use unattended installation for a network software. Outline **four** advantages of this installation method. (4 marks)

(c) Judy discovered several network vulnerabilities in her company's network. Outline **four** examples of these vulnerabilities that she could have noted. (4 marks)

(d) (i) Alice intends to use WiMAX (Worldwide Interoperability for Microwave Access) to interconnect the two network branches located in a town. Explain **two** features of this transmission media that could have influenced her decision. (4 marks)

(ii) Explain **two** challenges of a bus network topology. (4 marks)

5. (a) (i) Outline **three** challenges of a peer to peer network model. (3 marks)

(ii) Distinguish between a *hub* and a *switch*. (4 marks)

(b) (i) Outline **three** factors that determines the bandwidth of a transmission media. (3 marks)

(ii) Betty intends to troubleshoot a computer network for a client. Outline **four** common hardware troubleshooting tools that she could use. (4 marks)

(c) During network design, networks are categorized based on the number of nodes connected. Explain **three** such categories. (6 marks)

6. (a) Outline two parts of Ethernet MAC address. (2 marks)

(b) For each of the following functions of Ethernet frame, identify the field responsible:

(i) detects errors in an Ethernet frame; (1 mark)

(ii) describes which higher-level protocol is used; (1 mark)

(iii) notifies the destination to get ready; (1 mark)

(iv) shows frame MAC address of the origin. (1 mark)

(c) Carrier Sense Media Access/Collusion Detection uses several steps that guarantee delivery of data packet from sender to receiver host. Outline **four** such steps. (4 marks)

(d) (i) Outline **four** factors that should be considered before installing communication software in a computer. (4 marks)

(ii) Margret was diagnosing a tablet that was not connecting to the company's WIFI. Outline **three** possible causes and solutions for the problem. (6 marks)

7. (a) Describe **two** types of fibre-optic connectors. (4 marks)

(b) (i) Outline **two** disadvantages of time-division multiplexing scheme (TDM). (2 marks)

(ii) Distinguish between *access rate* and *committed information rate* as used in frame relay configurations. (4 marks)

(c) Joan was required to install a computer network to use the most current technology in data communication. Explain **two** challenges that she could have experienced during the installation. (4 marks)

(d) Internet Service Providers (ISP) prefer using Point-to-Point protocol when connecting their customers to WAN. Explain **three** advantages that could have influenced the trend. (6 marks)

8. (a) (i) Outline **two** characteristics of WAN. (2 marks)

(ii) Distinguish between *unicast* IPv6 *address* and *anycast* IPv6 *address*. (4 marks)

(b) Paul noted that Cyclic Redundancy Check (CRC) is an error-detecting scheme that is commonly used in data communication systems. Outline **four** advantages that could be influencing this trend. (4 marks)

(c) Every Ethernet uses Address Resolution Protocol for it to function properly. Explain **two** functions of this protocol. (4 marks)

(d) Figure 2 shows a TCP/IP model. Use it to answer the questions that follows.

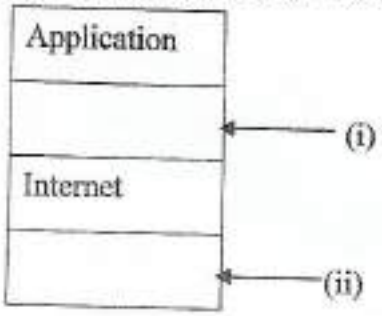

Figure 2

(i) Explain the function of the layers labelled (i) and (ii). (4 marks)

(ii) List **four** protocols that could be used in the application layer. (2 marks)

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