# THE KENYA NATIONAL EXAMINATIONS COUNCIL

# DIPLOMA IN INFORMATION TECHNOLOGY

## MODULE III

DATA COMMUNICATION

3 hours

## INSTRUCTIONS TO CANDIDATES

*You should have the following for this examination:*

*Answer booklet.*

*Answer any FIVE of the following EIGHT questions.*
*All questions carry equal marks.*

**This paper consists of 6 printed pages.**

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

1. (a) (i) Distinguish between *microwave* and *infrared* signals as applied in data communication. (4 marks)

(ii) The data 1010011 is to be modulated through the use of the **three** modulation techniques. Sketch the resulting signal for each technique. (6 marks)

(b) (i) With the aid of a sketch, describe the *skew problem* as applied in parallel transmission. (3 marks)

(ii) For the problem described in (i) suggest **one** possible solution. (2 marks)

(iii) State **one** application of parallel transmission. (1 mark)

(c) A connection between two devices supports serial transmission at a data rate of 19,200 bit/s. Both devices have an 8 Kbytes file which they need to send to each other. Calculate the shortest possible time required for complete transmission assuming:

I. full duplex transmission;

II. half duplex transmission. (4 marks)

2. (a) (i) Explain the **one** advantage of synchronous over asynchronous data transmission. (2 marks)

(ii) The data 11000101 is to be encoded using NRZ-I (Invert on ones) and pseudoternary encoding schemes. Sketch the resulting signal for each schemes. (4 marks)

(b) A bank is to transmit data from Kenya to United States of America. Describe **three** transmission impairments likely to affect the data while on transit. (6 marks)

(c) (i) State the *sampling theorem* as applied in *pulse code modulation*. (2 marks)

(ii) With the aid of a diagram describe *delta* modulation technique. (4 marks)

(d) Explain the function of a *demultiplexor*. (2 marks)

3. (a) (i) Distinguish between *wavelength division multiplexing* and *code division multiplexing*. (4 marks)

(ii) Explain **one** advantage of distributed routing algorithm. (2 marks)

(b)   Using the polynomial generator $x^5+x^3+1$, calculate the CRC needed for the transmission of data stream 1001011. (4 marks)

(c)   Explain the function of each of the following layers of the OSI reference model:

(i)   data link;

(ii)  session;

(iii) presentation. (6 marks)

(d)   Explain **two** factors that necessitate network segmentation. (4 marks)

4.   (a)   (i)   With the aid of a diagram, describe circuit switching technique. (4 marks)

(ii)  Distinguish between the **two** types of ISDN interfaces. (4 marks)

(b)   (i)   Outline the procedure for manually assigning a computer an IP address. Assume window based operating system environment. (4 marks)

(ii)  Explain **one** danger that may arise due to use of *telnet* service by organizational employees. (2marks)

(c)   Figure 1 shows a typical port in a computer system. State **two** devices that may be connected to the port. (1 mark)



Figure 1

(d)   (i)   Identify **three** levels of synchronization that may be applied in a communication system. (3 marks)

(ii)  State **two** disadvantages of a mesh topology. (2 marks)

5.   (a)   Explain the following terms as applied in error control:

(i)   overhead bits;

(ii)  sliding window. (4 marks)

(b)   (i)   Outline **three** security levels that can be applied in a network. (3 marks)

(ii)  Distinguish between a *datagram* and a *frame*. (4 marks)

(c)    During network configuration, a student used the commands *ping* and *traceroute*. Distinguish between the **two** commands.     (4 marks)

(d)    Describe the operation of a *bridge*.     (5 marks)

6.    (a)    (i)    Define the following terms as applied in data communication:

        I.    protocol;

        II.    parity bit.     (2 marks)

    (ii)    Explain the term *piggy backing* as applied in data transmission     (2 marks)

(b)    Figure 2 shows a window generated during a browsing session. Use it to answer the questions that follows.



Figure 2

(i)    State **two** possible causes of the message generated.     (2 marks)

(ii)    Other than the web browser displayed in the window, state **two** other browsers that can be used.     (2 marks)

(iii)    Explain the function of each of the features labeled I and II .     (3 marks)
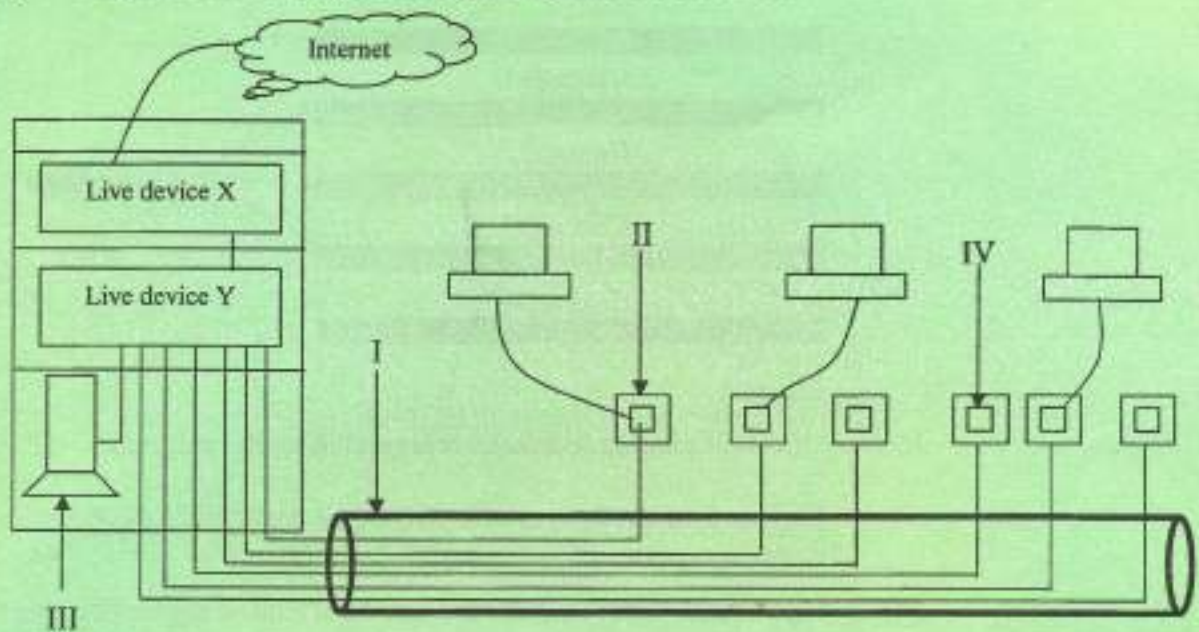
(c) Figure 3 shows a typical design diagram for a network.



Figure 3

(i) Name the parts labeled I, II, III and IV. (4 marks)

(ii) Identify the live device X and Y. (2 marks)

(iii) If a firewall (hardware-based) is to be installed, describe the appropriate place for its location. (3 marks)

7. (a) Outline **four** advantages of fibre optic cable over coaxial cable.

(4 marks)

(b) Plazo International Company has won a tender to install a wide area network for a particular bank across the country.
Explain **four** factors to be considered during network design.

(8 marks)

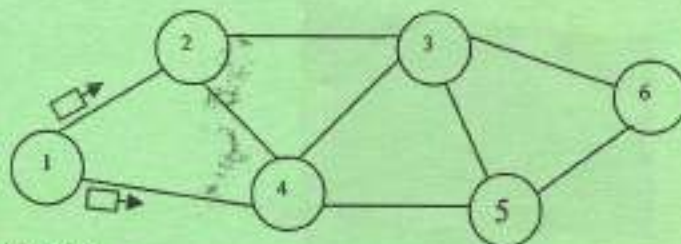(c) Figure 4 shows a network with 6 nodes and 9 links. A packet is to be routed from node 1 to node 6.



Figure 4

(i) Assuming flooding routing technique, draw diagrams to represent packet retransmission in the second and third hops. (3 marks)

(ii) Explain **one** disadvantage of flooding routing techniques. (2 marks)

(iii) State **one** application of flooding routing technique. (1 mark)

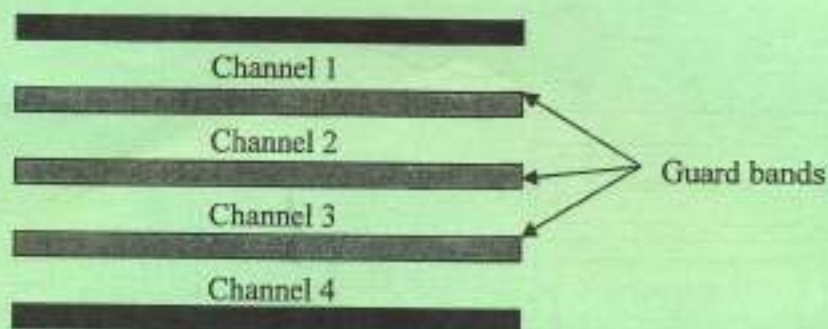(d)    Study figure 5 and then answer the question that follows.



Figure 5

Identify the multiplexing technique represented by the diagram.    (2 marks)

8.    (a)    (i)    Explain **two** advantages of installing air conditioning systems in a computer room.    (4 marks)

(ii)    Distinguish between *data rate* and *baud rate* as applied in data transmission.    (2marks)

(iii)    Describe a *virtual circuit*.    (2 marks)

(b)    The following are typical IP addresses for computers in a network.

(i)    129.151.4.8

(ii)    192.110.103.22

(iii)    122.117.100.21

Identify the class for each IP address.    (3 marks)

(c)    Describe the following network standards:

(i)    10Broad36;

(ii)    1000BaseT;    (4 marks)

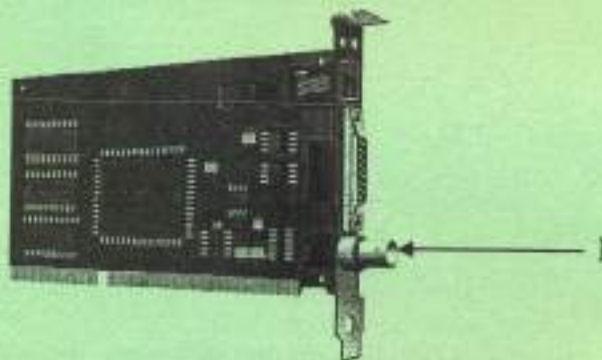(d)    Figure 6 shows a typical network interface card.



Figure 6

(i)    Identify the type of topology supported by port I.    (2 marks)

(ii)    Explain **three** limitations of the topology identified in (i).    (3 marks)