1. (a) Define each of the following terms as used in data communication:

   (i) asymmetric duplex; (2 marks)

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   (ii) gateway. (2 marks)

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   (b) Jane found the terms: concentrator, front end processor and transducer while revising through her data communication notes. Explain to Jane the function of each of the devices. (6 marks)

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   (c) An upcoming telecommunication company intends to introduce digital encoding schemes for transmitting data. Explain three factors that should be considered when determining the type of scheme to use. (6 marks)

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(d)    Differentiate between hierarchical and multipath routing algorithms.    (4 marks)

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2.    (a)    Outline **two** ways in which error correction is realized in a data communication system.

    (2 marks)

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(b)    Explain the function of each of the following NIC components:

    (i)    expansion bus connector;    (2 marks)

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    (ii)    transceiver.    (2 marks)

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(c)    Describe the media access method used in each of the following network topologies, giving an example of application in each case:

    (i)    bus;    (3 marks)

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_____

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    (ii)    ring.    (3 marks)

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(d) Figure 1 is a web address for Barafumoto Company Ltd.

**http://www.barafu moto.ac.ke/explain.htm**

(i)  (ii)  (iii)  (iv)

Figure 1

Explain the function of each of the parts labelled (i), (ii), (iii) and (iv).  (8 marks)

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3  (a)  (i)  Explain the function of X21 as used in data communication systems.

(2 marks)

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(ii)  State **two** uses of each of the following Ethernet cables:

I.  10 BaseT;  (2 marks)

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II.  10 Base5.  (2 marks)

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(b) Describe **two** specifications associated with the data link layer of the OSI. (4 marks)

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(c) Explain the **three** disadvantages of using AM radio broadcasting in communication.

(6 marks)

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(d) Differentiate between code and space division multiplexing techniques. (4 marks)

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4 (a) (i) Outline **four** analog to digital modulation techniques. (4 marks)

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(ii)     Assuming circuit switching mechanism, describe the process of communication between two network nodes.       (2 marks)

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(b)     Data communicating devices use both synchronous and asynchronous data transfer mode. Explain **two** challenges of using synchronous mode.       (4 marks)

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(c)     A radio station uses frequency modulation for its transmission of signals. Explain **two** ways in which the modulation is achieved.       (4 marks)

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(d)    (i)     With the aid of a diagram, outline the structure of a tree network topology.       (2 marks)

(ii) Makapa steel industry uses a passive hub, but has been advised to replace it with an intelligent hub. Explain **two** advantages that the intelligent hub could offer.

(4 marks)

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5 (a) Define each of the following terms as used in data communication:

(i) encapsulation; (2 marks)

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(ii) remote echo. (2 marks)

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(b) Explain **two** characteristics of a Metropolitan Area Network. (4 marks)

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(c) With the aid of a diagram, describe a UDP packet. (8 marks)

(d) Differentiate between cut through and store-forward switching methods. (4 marks)

6 (a) Explain **two** applications of RS-485 as defined by Electronic Industries Alliance (EIA). (4 marks)

(b) A broadcasting media house uses microwave link for its transmission. Explain **three** properties of the link. (6 marks)

(c) Distinguish between serial and parallel methods of data transmission as used in tel ecommunication. (4 marks)

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(d) The following stream of bits are to be transmitted through a data communication system 10100111. Sketch the line code for the transmission signal for each of the following encoding schemes.

  (i) Differential Manchester;

  (ii) Non Return to Zero Space;

  (iii) Code Mark Inversion. (6 marks)

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7 (a) State **two** advantages of message switching. (2 marks)

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(b) (i) Outline the function of each of the following protocols as applied in the OSI:
  I. Telnet; (2 marks)

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  II. Network Time Protocol (NTP). (2 marks)

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(ii)     Explain **two** services offered by the session layer of the OSI reference model.

(4 marks)

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(c)     At the Nyuki radio station, the FM radio operates on a frequency band of
$f_L = 88$ MHz to $f_H = 108$ MHz. Calculate the bandwidth.     (2 marks)

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(d)     Figure 2 shows a coaxial cable. Explain the function of each of the parts labelled
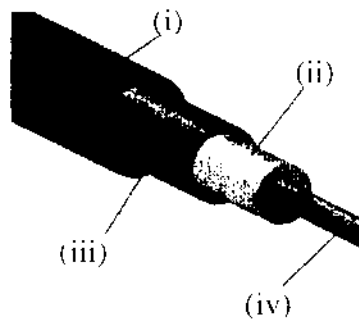(i), (ii), (iii), and (iv).



Figure 2

(8 marks)

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8.  (a)  Explain **three** disadvantages of client/server network.  (6 marks)

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(b)  A network administrator at Weltel Company introduced Internet Message Access
     Protocol (IMAP) to replace Post Office Protocol (POP) in the organization.
     Explain **two** advantages of IMAP that have influenced the administrator's decision.
     (4 marks)

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(c)  Figure 3 shows costs in dollars ($) in a communication system from one vertex to the
     next. Using Dijkstra's algorithm solve the path with the lowest cost from vertices a
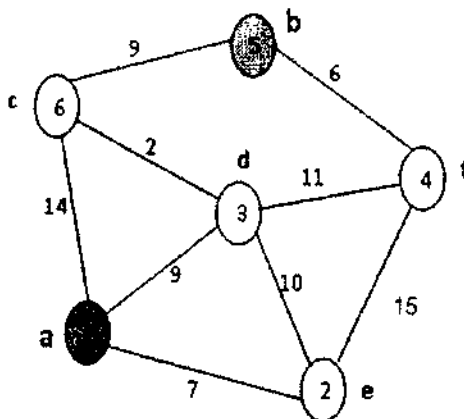     to b.  (6 marks)



Figure 3