1. (a) Using examples describe the following concepts as applied in data communications:

(i) Data Terminal Equipment (DTE);
(ii) half duplex connection;
(iii) full duplex connection.

(6 marks)

(b) With the aid of a sketch describe each of the following transmission media:

(i) satellite link;
(ii) microwave. (4 marks)

(c) Explain each of the following keying techniques:

(i) amplitude shift keying;
(ii) frequency shift keying;
(iii) phase shift keying.

(6 marks)

(d) Describe the role of Carrier Sense Multiple Access/Collision Detect or [CSMA/CD] in data communication. (4 marks)

2. (a) (i) Explain the term 'multiplexing' as used in data transmission.

(ii) With the aid of a diagram explain Frequency Division Multiplexing.

(8 marks)

(b) Describe the following mechanisms of packet switching:

(i) virtual circuit;
(ii) datagrams networks;
(iii) message switching.

(6 marks)

(c) (i) Outline **three** advantages of Digital Transmission over Analogue;

(ii) Distinguish between centralised and distributed networks.

(6 marks)

3. (a) Distinguish between unipolar and bipolar signals. (4 marks)

(b) An analogue signal carries four bits in each signal element.
If 1000 signal elements are sent per second, determine the following:

(i) band rate;
(ii) bit rate.

(6 marks)

(c) Describe the following encoding techniques:

(i) NRZ-L;

(ii) NRZ-I.

(4 marks)

(d) (i) Define the concept 'propagation delay'.

(ii) Differentiate between blocking and non-blocking as used in switching giving **one** example in each case. (6 marks)

4. (a) Describe **four** communication packages in data communication. (4 marks)

(b) Outline the operations of an electronic mailing system. (5 marks)

(c) Explain the operation of checksum generator. (4 marks)

(d) With the aid of a diagram, describe the operations of a Tree Topology Scheme in computer networks. (7 marks)

5. (a) With the aid of a diagram, explain the working of an X-25 interface. (7 marks)

(b) Explain the following routing techniques:

(i) adaptive;
(ii) brouter;
(iii) flooding. (6 marks)

(c) Using sketches explain the following communication concepts:

(i) scalability;
(ii) transparency;
(iii) token passing.

(7 marks)

6. (a) Omega Club has been in operation in Kenya for the last two years. The club intends to expand its operations to the rest of the East African countries.

(i) Describe **two** networks they can implement.
(ii) List **two** advantages of networking in an enterprise.

(8 marks)

(b) Outline **three** services that an Integrated Service Digital Network (ISDN) offers to the user. (3 marks)

(c) The proprietor of Uzuri Supermarket wants to network his chain of seven outlets to enhance efficiency.

(i) Identify an appropriate network for Uzuri.

(ii) Discuss the operations of the proposed network;

(iii) Suggest **two** limitations of the topology identified in (i).

(9 marks)

7. (a) Ken has been requested to make a presentation in a workshop on the Open System Interconnection (OSI) model of communication.

(i) Identify the **three** lowest levels in the model.

(ii) Explain the function of each level in (i).

(iii) Explain **three** advantages of the layered architecture.

(9 marks)

(b) Describe the Transport Control Protocol/IP (TCP/IP). (3 marks)

(c) Discuss the following terms as applied in data communications:-

(i) piggy backing;
(ii) bit stuffing.

(4 marks)

(d) Outline **two** benefits to the user for applications of Basic Rate Interface (BRI) service as applied in Integrated Service Digital Network (ISDN). (4 marks)

8. (a) Using a diagram explain the operation of each of the following:

(i) Longitudinal Redundancy Check Generator (LRC)-G;

(ii) Longitudinal Redundancy Check Checker (LRC)-C.

(10 marks)

(b) Define the Guided Transmission Media giving **two** suitable examples.

(2 marks)

(c) Explain the causes and methods used to minimize each type of the following noise:

(i) thermal noise;
(ii) impulse noise;
(iii) cross talk;
(iv) jitter.

(8 marks)