

SECTION A

- 1. B**
- 2. D**
- 3. D**
- 4. C**
- 5. A**
- 6. B**
- 7. D**
- 8. A**
- 9. B**
- 10. C**
- 11. A**
- 12. D**
- 13. C**
- 14. B**
- 15. A**

Award 2 marks for each correct answer. Total = 30 marks.

SECTION B**B1.**

a) Describe the **three (3)** typical types of transmission modes.

(6 marks)

Model answer

Simplex

Half Duplex

Full Duplex

2 marks for each correct answer with explanation – 3 answers (Total = 6 marks)

B2.

Define the following characteristics of a sine wave:

a) *Period*

(2 marks)

b) *Frequency*

(2 marks)

c) *Amplitude*

(2 marks)

(6 marks)

Model answer

a) Period – Refers to the amount of time, in seconds, a signal needs to complete one cycle.

2 marks for explanation (Total = 2 marks)

b) Frequency – Refers to the number of periods in one second. The frequency of a signal is its number of cycles per second.

2 marks for explanation (Total = 2 marks)

c) Amplitude – The value of a signal at any point on the wave. It is equal to the vertical distance from a given point on the wave form to the horizontal axis. Measured in volts or watts.

2 marks for explanation (Total = 2 marks)

B3.

a) Describe **two (2)** functions of the OSI model's *physical* layer. (2 marks)

b) What is the difference between a *physical* network address and a *logical* network address? (4 marks)

(6 marks)

Model answer

a) - Coordinates the functions required to transmit a bit stream over a physical medium.

- It defines the characteristics of the interface between the devices and the transmission medium.

- It also defines the type of transmission medium.

- Encoding bits into signals.

1 mark for each correct answer – 2 answers (Total = 2 marks)

b) Physical Address - Physical address is the IP address of a computer on the network. Example 192.168.1.1 is a physical address.

Logical Address- The Medium Access Control Address of a computers on the network. Logical address is normally in hexadecimal format.

2 marks for each correct answer – 2 answers (Total = 4 marks)

B4.

a) Define **two (2)** advantages of *shielded twisted pair* over *unshielded twisted-pair*. (2marks)

b) Why is *frequency* modulation better than *amplitude* modulation? (4 marks)

(6 marks)

Model answer

a) - Reduces Cross Talk

- Reduces Electromagnetic Noise

1 mark for each correct answer – 2 answers (Total = 2 marks)

b)-Bandwidths of an FM signal is equal to 10 times the bandwidth of the modulating signal

- In FM the frequency of the carrier signal is modulated to follow the changing voltage level (amplitude) of the modulating signal.
- The peak amplitude phase of the carrier signal remains constant, but as the amplitude of the information signals changes, the frequency of the carrier changes correspondingly.

2 marks for each correct answer – 2 answers (Total = 4 marks)

B5.

a) What is the difference between *encoding* and *modulation*? (3 marks)

b) Describe the process involved for *digital* to *analog* conversion? (3 marks)

(6 marks)

Model answer

a) Encoding – Is a process of transforming information into signals that are carried over a media.

Modulation – Modification of one or more characteristics of a carrier wave by an information bearing signal.

1.5 mark for each correct answer – 2 answers (Total = 3 marks)

b) Digital to analog Conversion – is the process of changing characteristics of an analog signal based on the information into digital signals. It uses Phase Shift Keying (PSK) conversion methods.

3 marks for explanation (Total = 3 marks)

SECTION C

Answer any FOUR questions in this section.

Each question is worth 10 marks.

This section carries a total of 40 marks.

C1.

Explain the *bus topology*. List **two (2)** advantages and **three (3)** disadvantages of the bus topology. **(10 marks)**

Model answer

In a Bus topology, nodes are connected to the bus cable by drop lines and taps. A drop line is a connection running between the devices and the main cable. A tap is a connector that either splices into the main cable or punctures the sheathing of a cable to create contact with the metallic core. As signal travel along the backbone, some of its energy is transformed into heat. Therefore its signal becomes weaker.

Advantages

- Easy to install
- Uses less cabling

Disadvantages

- Difficult reconfiguration and fault isolation
- A fault or break in the bus cable stops all transmission
- Adding new devices require modification or replacement of the backbone

**5 marks for definition. 2 marks for advantages and 3 marks for disadvantages
(Total = 10 marks)**

C2.

a) Compare and contrast between *circuit switching* and *packet switching*. **(5 marks)**

b) Compare and contrast an *analog signal* with a *digital signal*. **(5 marks)**

(10 marks)

Model answer

Circuit Switching – Creates a direct physical connection between two devices such as phone or computers.

Packet Switching – Each packet is treated independently from others. Also called datagram's.

2.5 marks for each component. (Total = 5 marks)

Analog Signal – The sinew wave is an analog signal. Visualized as a simple oscillating curve, its changes over the course of a cycle is smooth and consistent, a continuous rolling flow.

Digital Signal – Digital Signal is represented by a 1 and 0. Digital signals are discrete in nature.

2.5 marks for each answer – 2 answers (Total = 5 marks)

C3.

a) Describe **two (2)** responsibilities of the OSI model's *network layer*. (5 marks)

b) Describe **two (2)** criteria necessary for an effective network. (5 marks)

(10 marks)

Model answer

a) **Network Layer** – Responsible for source to source destination delivery of a packet possibly across multiple networks (links). Specific responsibilities of the network layer includes:

- **Logical Addressing:** If a packet passes the network boundary, we need another addressing system to help distinguish the source and destination systems. The network layer adds a header to the packet coming from the upper layer.

- **Routing:** When independent networks or links are connected together to create an internet work or a large network, the connecting devices called routers route the packets to their final destination.

2 marks for definition. 2.5 marks for each function – 2 answers (Total = 7 marks)

b) - **Performance**

- **Reliability**

2.5 marks for each correct answer with explanation answer (Total = 5 marks)

C4.

- a) Define **three (3)** advantages of *coaxial cable* over *twisted-pair cable*. (3 marks)
- b) Describe the Carrier Sense Multiple Access with Collision Detection (CSMA/CD) medium access method. (5 marks)
- c) Define the **two (2)** main sub-layer(s) within the data link layer for the OSI model. (2 marks)

(10 marks)**Model answer**

- a) - Less Noise Resistance
- Less Signal attenuation
- Higher bandwidth

1 mark for each correct answer – 3 answers (Total = 3 marks)

- b) - In CSMA/CD any workstation wishing to transmit must first listen for existing traffic on the line.

- If no signals are found the line is idle and the transmission is initiated.
- If another station has transmitted too recently for its signal to have reached the listening station, the listener assumes the line is idle and introduces its own signal on the line.
- This would result in collision happening on the network.
- The station transmitting sending the signal would stop sending further signals and wait for a random before trying again.

1 mark for each correct description (Total = 5 marks)

- c) - Logical Link Control (LLC)
- Media Access Control (MAC)

Note: 1 mark for each correct answer – 2 answers (Total = 2 marks)**C5.**

- a) Describe **two (2)** advantages of a *fibre optic* cable. (4 marks)
- b) What is meant by the notation: *10 Base 5* used for thick Ethernets and what type of signals does it carry? (4 marks)

c) Determine the *class* address for the following IP address. (2 marks)

- i) 192.168.1.1
- ii) 10.10. 20.1

(10 marks)

Model answer

a) - Noise Resistance

Fiber optic transmission uses light rather than electricity, noise is not a factor.

- Less signal attenuation

Fiber optic transmission distance is significantly greater than other guided media. A signal can run for miles without regeneration

1 mark for advantage and 1 mark for explanation - 4 answers (Total = 4 marks)

b) -10 Mbps,

- Baseband transmission mode,

- 500 Meters in length

- Digital signals

1 mark for each answer (Total = 4 marks)

c) i) 192.168.1.1 - Class C

ii) 10.10. 20.1 - Class A

1 mark for correct answer 2 answers (Total = 2 Marks)