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| NWEG TAKE HOME EXAM  ST10053561 |
| |  |  |  | | --- | --- | --- | | VENKATA VIKRANTH JANNATHA | 6/27/22 | NWEG5111 | |

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# Question 1

1. (White, 2016)
   1. B
   2. E
   3. B
   4. A
   5. D
   6. C
   7. D
   8. C
   9. A
   10. E

# Question 2

1. (White, 2016)
   1. Servers
   2. Network layer
   3. Application layer
   4. Local Area network (LAN)
   5. Asynchronous Transfer Mode
   6. DNS
   7. Zigbee/Bluetooth
   8. Metropolitan Area Network (MANs)
   9. Password/Firewall
   10. Cryptography

# Question 3

## Q 3.1 Briefly discuss Fibre-optic cable?

In (White, 2016, pp. 68 - 69)Fibre optics is a technology that transmits data using light via glass (silica) or plastic threads that are just a little bit thicker than human hair. It can transmit significant volumes of data at speeds as high as (100 gbps), experiences remarkably little noise, and is immune to electromagnetic interference.

It transmits data using a "photo diode" light source, which is a light source attached to the end of a fibre optic cable to create the light pulses that flow through the cable. Photo receptor optical cable detects photo diode transmission through the cable. At the end of the fibre optic line is a device called a photo receptor has been situated which receives light pulses and transforms them.

### The advantage of fibre optic cable:

🡪One of fibre optic cable's main benefits is the absence of noticeable noise.

### The disadvantage of fibre optic cable:

🡪Light pulses can only flow in one direction thanks to the configuration of the light source and photo receptor.

🡪Compared to the twisted pair cable, it is more expensive.

## Q3.2 Briefly discuss Synchronous connection?

In (White, 2016, pp. 110 - 111)Synchronous connections make use of multi-character frames, which can occasionally number in the thousands of characters. To allow the receiver to maintain synchronization across this lengthy frame, synchronous transmission must be combined with a synchronizing clock signal or some form of self-clocking.

There are three ways to synchronize the transmitter and receiver:

1. Over a separate line that is parallel to the data stream, send a synchronizing clock signal. A clock signal arrives on a second line concurrently with the data on one line. This clock signal can be used by the receiver to maintain synchronization with the incoming data.

2. Manchester codes should be used when sending a digital signal. The receiver may anticipate this signal transition and read the incoming data stream without making any mistakes because a Manchester code always has a signal transition in the middle of each bit. A self-clocking signal is one that has been Manchester encoded.

3.When transmitting an analog signal, the analog signal's character can be used for self-clocking.

### Advantages of Synchronous connection:

1. Simple to implement

2. Results are known right away

3. A more sophisticated error-checking method

4. Faster response times.

### Disadvantages of Synchronous connection:

1 Service must be operational and ready.

2. Frequently calls for connection-oriented protocol

3. A little more difficult

4. Hardware costs more money

## Q3.3 Briefly discuss Wide Area Network?

In (White, 2016, pp. 247-248), An interconnection of computers and computer-related devices that carry out a certain purpose or functions, usually utilizing local and long-distance telecommunications networks, can cover portions of one or more states, multiple nations, or even the entire planet.

Through a WAN provider, WANs can make it easier for devices all around the world to communicate, share information, and do much more.

Equipment’s for Wide area network:

Station: The device that a user interacts with to access a network; it houses the software program that enables one to utilize the network for a certain function.

Node: A computing device that decides which path a piece of data will take next and allows workstations to connect to the network.

Subnetwork, the underlying physical network of nodes and communication links that supports a network, is the support structure for Wan.

## Q3.4 Briefly discuss Data and Signals?

The two fundamental components of computer networks are data and signals. Regardless of the communication technology, all data is either digital or analog. Signals are electronic or electromagnetic impulses used to encode and transfer data. Data are things that communicate meaning within a computer system.

The following are four possible data and signal combinations.

🡪 Modulation, which transforms analog data into analog signal form.

🡪 Digital data that has been transformed into an analog signal, like in a modem.

🡪Quantization, which transforms analog data into a digital signal.

🡪The conversion of digital data, such as encoding techniques, into digital signal form.

# Question 4

## Q 4.1 Describe the basic functions of a network operating system using a diagram?

Network operation system, there are two types of namely peer to peer network and Client server network.

## Peer to peer network:

Diagram

Description automatically generated

According to (Indeed Editorial Team, 2021),an information technology (IT) architecture known as a peer-to-peer network enables two or more computer systems to connect and share resources without the need for a separate server or server software. P2P networks can be created in offices by either physically connecting computers to a networked system or by establishing a virtual network. Computers can be configured to act as the network's clients and servers.

### Main advantages of using a Peer-to-peer network:

🡪Simple file sharing: A complex peer to peer network allows for the rapid transfer of files over long distances. Access to files is always possible.

🡪Cost savings: When setting up a Peer-to-peer network, there is no need to spend extra money on a server computer. Both a network operating system and a full-time system administrator are not necessary.

🡪Adaptability: A Peer-to-peer network can easily grow to include additional users. These networks are more adaptable than client-server networks thanks to this advantage. It can scale up.

## Client server

According to (Indeed Editorial Team, 2021),the method used to transfer data from a server to a digital device is known as a client-server model. The client-server model outlines a specific method by which devices access data held on servers. It promotes consistency across all devices by enabling numerous clients to launch apps or download files from a single server. All industries that employ servers to store and access information use client-server architectures often.

Client categories include:

Laptops

Smartphones

Tablets

Computers on a desk.

### The advantages of using a client-server model:

🡪The client-server architecture uses a scheduling system to prioritize client messages so that servers may handle numerous requests at once.

🡪Client-server models enhance the capabilities of any computer by utilizing resources from other devices via a server.

🡪Since client-server data is platform-neutral, it can be used on a variety of devices.

## Q4.2 Explain by an example of a situation in which a virtual Lan might be a useful tool in a business environment?

According to (IT support & managed service, 2020),A VLAN allows you to segment a network without the need for additional hardware. As a result, you can connect many networks to a single physical switch.

A network can be organized by department or user type by grouping computers, servers, or other resources. The computers could be located on different floors of a building or in multiple places.

### These are the reasons why Virtual Lan could be a beneficial tool in a business setting.

🡪help with network efficiency by reducing unnecessary help with network efficiency by reducing unnecessary traffic.

🡪improve security by establishing a virtual boundary around that business unit.

🡪improve bandwidth performance by limiting node-to-node and broadcast traffic.

🡪It reduces workplace disruption by eliminating the need to physically match up ports and switches on a network.

### Other Factors That can influence Virtual LAN Implementation:

A Virtual LAN can also prioritize data, differentiate between private and public networks, and encrypt individual devices.

For example, if you connect to a hotel's public Wi-Fi, you will be unable to access their internal business resources. This is due to the segmentation of backup servers and other resources. The private network connects all the back-of-house computers. You cannot access them on the public network because of the VLAN.

## Q 4.3 Compare the differences between EBCDIC, ASCII, and Unicode?

In (White, 2016, pp. 51-53),EBCDIC, UNICODE, and ASCII. Each of these are character sets. A list of letters, numbers, symbols, etc. that have been given a binary value to enable use is known as a character set.

Extended Binary Coding Decimal Interchange Code, or EBCDIC mainframe computers and high-end servers are the major platforms for this coding scheme. The most widely used format for text files on computers and the Internet is ASCII (American Standard Code for Information Interchange). Each alphabetic, numeric, or special character in an ASCII file is represented by a 7-bit binary number (a string of seven 0s or 1s).

There are defined 128 potential characters. Like ASCII, the UNICODE coding system aims to use two bytes per character to represent most of the world's languages.

## Q 4.4 Identify the primary differences between baseband technology and broadband technology and provide two examples for each?

Baseband signal: It normally transmits data over the bus using a single digital signal. The entire spectrum of the wire is used by one single digital transmission (White, 2016, p. 181).

Examples: Ethernet and serial wires.

Broadband signal: To divide the available medium into several channels, broadband technology uses analog signalling in the form of frequency division multiplexing. Each channel can handle a single stream of video, audio, or data.

Example: Cable TV and Internet (White, 2016, p. 181).

## Q 4.5 Explain why we need interface standards?

In (White, 2016, pp. 103-104), Interface standards assist in establishing the system's essential, widely used design elements. These rules help in establishing consistency everywhere. Additionally, it guarantees that your users can realize the various interface components in your design and that they are aware of where to find which functions.

# Question 5:

## Q 5.1 What is the difference between shared and Dedicated segments using business example?

According to the Business Spectrum Enterprise (Charter Communications, 2022) Dedicated Internet access guarantees constant bandwidth. If a company subscribes to a 100 Mbps dedicated Internet connection, it will always have 100 Mbps of bandwidth available.

Shared Internet connection provides a limited amount of bandwidth that is shared among all subscribers. If a company subscribes to a 100 Mbps shared Internet connection, it may receive 100 Mbps at times, but it will almost certainly receive significantly less bandwidth during peak traffic hours when other customers are also utilizing the connection.

### The key difference of Dedicated and Shared network in terms of Spectrum Enterprise:

#### What is the difference between dedicated Internet and shared Internet for applications?

Having dedicated Internet access, technology such as VoIP phone systems, cloud applications, videoconferencing, video streaming apps, and remote desktops will perform significantly better.

#### What is the pricing difference between dedicated and shared Internet?

Dedicated Internet connection is more expensive than shared Internet access, but it can assist companies cut overall expenditures by enhancing productivity.

#### What is the difference in upload and download speeds between dedicated and shared Internet?

Dedicated Internet often provides synchronous upload and download rates, which means that bandwidth for both is assured to be the same. Fast upload speeds are essential for enterprises that have many distant users, cloud software, and VoIP technology. Upload speeds on shared Internet access are often much slower than download speeds.

#### What is the distinction between dedicated and shared Internet in terms of security?

Dedicated Internet access provides a private connection with more security than shared Internet access in business.

## Q 5.2 When designing or updating computer network systems, describe the factors you should consider for media selection criteria?

According to (White, 2016, pp. 89 - 92) there are five factors we should consider when designing or updating computer network system:

Cost, Backup, Security, Speed, environment, expandability, and distance.

Cost: Cost is a crucial concern when planning or implementing any computer network. Any computer network should be built to be inexpensive. It must be appropriate for the type of network, as personal networks are less expensive than wide area networks, which are commonly used in offices.

Security: Only authorized person can access the data, which is one of the most critical factors. It must also protect from electromagnetic signal which someone can listen especially in the cables or wireless communication.

Speed: Network speed is extremely crucial in a computer network system because data must be moved from one device to another as rapidly as feasible. The expansion of a technological network must be capable of supporting larger data transfers.

Environment: Some computer networks are not acceptable for the environment because they emit electromagnetic radiation through cables and wireless networks. Before designing a computer network, it is critical to consider the intended environment and how it may influence or interfere with communications.

Expandability and distance: When developing a network, it should also consider a network that can be extended over a greater distance. Because some network cables or wireless networks cannot provide a network over a longer distance, this is where expansion comes in. Finally, when contemplating expandability, keep right-of-way in mind.

## Q 5.3 Briefly describe how Wavelength Division Multiplexing works?

In (White, 2016, p. 130)The approach assigns a uniquely coloured laser to each input source and combines the input sources' various optical signals so that they can be amplified as a group and carried across a single fibre. It is important to note that, due to the qualities of the signals and glass fibre, as well as the nature of light itself, each signal carried on the fibre can be sent at a different pace than the others.

This indicates that a single fibre-optic line can handle transmission speeds of 51.84 Mbps, 155.52 Mbps, 622.08 Mbps, and 2.488 Gbps at the same time (which, incidentally, are multiples of T-1 speeds and are defined as OC-1, OC-3, OC-12, and OC-48, the optical carrier specifications for high-speed fibre-optic lines).

Furthermore, a single fibre-optic line can handle a variety of transmission types, including SONET, Asynchronous Transfer Mode (ATM), and others, in various combinations.

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