Course Code	**:**	**BCS-041**
Course Title	**:**	**Fundamentals of Computer Networks**
Assignment Number	**:**	**BCA(4)/041/Assignment/2022-23**
Maximum Marks	**:**	**100**
Weightage	**:**	**25%**
Last Date of Submission :		**31st October, 2022 (for July Session)** **15th April, 2023 (for January Session)**

This assignment has four questions for a total of 80 marks. Answer all the questions. Each question carries 20 marks. Rest 20 marks are for viva voce.

Q1. Given the network address 132.21.0.0, find the class, the block, and the range of the addresses.

A1. The class of the network is B and the addresses range from 132.21.0.0 to 132.21.255.255.

Explanation:

Network Address

A network address denotes the specific location where a resource is placed on the internet. Every website has a unique network address and each network address is classified into classes.

Furthermore, each class has a particular range of addresses:

Class of the Network

There are a total of five classes of networks from A to E.

Network address 132.21.0.0 has a class B because the first byte is between 128 and 191.

Range of the Network Address

The given network address has a network ID of 132.21. The addresses will start from 0 and will go on to 255. That's why the addresses range from 132.21.0.0 to 132.21.255.255.

Q2. Compare 3G, 4G and 5G network architectures.

A2.

1. THIRD GENERATION (3G)

The 3G standard utilises Universal Mobile Telecommunications System (UMTS) as its core network architecture. 3G network combines aspects of the 2G network with new technologies and protocols to deliver a significantly faster data rate. By using packet switching, the original technology was improved to allow speeds up to 14 Mbps. It used Wide Band Wireless Network that increased clarity. It operates at a range of 2100 MHz and has a bandwidth of 15-20 MHz. Some of the main features of 3G are:

Speed of up to 2 Mbps

Increased bandwidth and data transfer rates

Send/receive large email messages

Large capacities and broadband capabilities

International Mobile Telecommunications-2000 (IMT-2000) were the specifications by the International Telecommunication Union for the 3G network; theoretically, 21.6 Mbps is the max speed of HSPA+.

2. FOURTH GENERATION (4G)

The main difference between 3G and 4G is the data rate. There is also a huge difference between 3G and 4G technology. The key technologies that have made 4G possible are MIMO (Multiple Input Multiple Output) and OFDM (Orthogonal Frequency Division Multiplexing). The most important 4G standards are WiMAX and LTE. While 4G LTE is a major improvement over 3G speeds, it is technically not 4G. What is the difference between 4G and LTE?

Even after it was widely available, many networks were not up to the required speed of 4G. 4G LTE is a “fourth generation long term evolution”, capable of delivering a very fast and secure internet connection. Basically, 4G is the predetermined standard for mobile network connections. 4G LTE is the term given to the path which has to be followed to achieve those predefined standards. Some of the features of 4G LTE are:

Support interactive multimedia, voice, video.

High speed, high capacity and low cost per bit (Speeds of up to 20 Mbps or more.)

Global and scalable mobile networks.

Ad hoc and multi-hop networks.

3. FIFTH GENERATION (5G)

5G networks operate on rarely used radio millimeter bands in the 30 GHz to 300 GHz range. Testing of 5G range in mmWave has produced results approximately 500 meters from the tower. Using small cells, the deployment of 5G with millimetre wave based carriers can improve overall coverage area. Combined with beamforming, small cells can deliver extremely fast coverage with low latency.

Low latency is one of 5G’s most important features. 5G uses a scalable orthogonal frequency-division multiplexing (OFDM) framework. 5G benefits greatly from this and can have latency as low as one millisecond with realistic estimates to be around 1 – 10 seconds. 5G is estimated to be 60 to 120 times faster than the average 4G latency.

Active antenna 5G encapsulated with 5G massive MIMO is used for providing better connections and enhanced user experience. Big 5G array antennas are deployed to gain additional beamforming information and knock out propagation challenges that are experienced at mmWave frequency ranges.

Further, 5G networks clubbed with network slicing architecture enables telecom operators to offer on-demand tailored connectivity to their users that is adhered to Service Level Agreement (SLA). Such customised network capabilities comprise latency, data speed, latency, reliability, quality, services, and security.

Q3. **What is parity bit method? Explain its use with the help of an example.**

A3. Parity Bit

A parity bit is a bit, with a value of 0 or 1, that is added to a block of data for error detection purposes. It gives the data either an odd or even parity, which is used to validate the integrity of the data.

Parity bits are often used in data transmission to ensure that data is not corrupted during the transfer process. For example, every 7 bits of data may include a parity bit (for a total of 8 bits, or one byte). If the data transmission protocol is set to an odd parity, each data packet must have an odd parity. If it is set to even, each packet must have an even parity. If a packet is received with the wrong parity, an error will be produced and the data will need to be retransmitted.

The parity bit for each data packet is computed before the data is transmitted. Below are examples of how a parity bit would be computed using both odd and even parity settings.

Odd parity:

- Initial value: 1010101 (four 1s)
- Parity bit added: 1
- Transmitted value: 10101011
- Result: Odd parity (five 1s)

Even parity:

- Initial value: 1010101 (four 1s)
- Parity bit added: 0
- Transmitted value: 10101010
- Result: Even parity (four 1s)

The value of the parity bit depends on the initial parity of the data. For example, the binary value 10000000 has an odd parity. Therefore, a 0 would be added to keep the parity odd and a 1 would be added to give the value an even parity.

While parity checking is a useful way validating data, it is not a foolproof method. For instance, the values 1010 and 1001 have the same parity. Therefore, if the value 1010 is transmitted and 1001 is received, no error will be detected. This means parity checks are not 100% reliable when validating data. Still, it is unlikely that more than one bit will be incorrect in a small packet of data. As long as only one bit is changed, an error will result. Therefore, parity checks are most reliable when using small packet sizes.

Q4. What are the limitations of Amplitude Modulation.

A4. BLOCK 1 UNIT 2 2.4 AMPLITUDE MODULATION

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