SOLVED QUESTION PAPER
ON
BACHELOR OF COMPUTER APPLICATIONS (BCA) (Revised)
Term-End Examination
June, 2022

PAPER
ON
BCS-011: COMPUTER BASICS AND PC SOFTWARE

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BCS-011 : COMPUTER BASICS AND PC SOFTWARE

Time : 3 hours *Maximum Marks : 100*
(Weightage : 75%)

Note : *Question number **1** is **compulsory** and carries 40 marks. Attempt any **three** questions from the rest.*

1. (a) Perform the following operations : *5*

(i) Convert $(235)_{10}$ to binary

(ii) Convert $(10{\cdot}3750)_{10}$ to binary

(iii) Convert $(1011101)_{2}$ to decimal

(iv) Convert $(FABC)_{16}$ to binary

(v) Convert $(A5)_{16}$ to decimal

(b) What will be the storage capacity of a 2·5 inch diameter disk pack having 4 plates with each surface of the plate having 2048 tracks and each track having 512 sectors ? A sector can store 1024 bytes of data. *3*

(c) Explain the von Neumann Architecture with the help of a diagram. *4*

(d) Explain two features of the software that will be needed for each of the following operations : *6*

(i) Keeping track of files and directories.

(ii) Translating high level language program to machine language.

(iii) Identify and remove computer virus.

(e) Write an algorithm and draw the flowchart for finding the sum of the first 10 odd numbers. *7*

(f) Given the following IP addresses and Subnet mask, find the Net-ID : *3*

(i) IP address 10.1.5.7 with subnet mask 255.0.0.0

(ii) IP address 192.168.1.05 with subnet mask 255.255.255.0

(g) Explain the purpose of the following Networking devices. : *6*

(i) Network Interface Card

(ii) Modem

(iii) Repeater

(h) List any six advantages of e-learning. *3*

(i) List two advantages and one disadvantage of using Inkjet Printer. *3*

2. (a) Define the term Instruction in the context of a computer processor. Explain the role of control unit for execution of an instruction. *5*

(b) Differentiate between the following : *10*

(i) Static RAM and Dynamic RAM

(ii) RAM and ROM

(iii) Hard disk and Magnetic tapes

(iv) DVD and CD

(c) What is the role of a port in a computer ? Explain the use of (i) Parallel port, and (ii) Serial port in a computer. *5*

3. (a) Explain the terms client and server in the context of client/server architecture. Explain the three-tier client/server architecture with the help of a diagram. *5*

(b) What is an Open-source Software ? List any two objectives of an Open-source movement. List the name and purpose of any four Open-source Software. *5*

(c) Define the following in the context of an Operating System : *6*

(i) Batch Processing

(ii) Graphical User Interface

(iii) Multiprogramming

(iv) Time-Sharing System

(d) Given the values of three variables as x = 5, y = 8 and z = 13, what would be the output of the following expressions in C programming language ? *4*

(i) x = = y

(ii) (x + y) = = z

(iii) y < z

(iv) x ! = z

4. (a) Explain the terms in the context of Computer Network : *6*

(i) Half Duplex

(ii) Channel

(iii) Packet Switching

(iv) Bandwidth

(b) Explain the characteristics of Local Area Networks. How are LANs different from WANs ? *5*

(c) What is a URL in the context of Internet ? Explain with the help of an example. Also explain the role of DNS with the help of an example. *4*

(d) Explain the characteristics of the following : *5*

(i) WIKI

(ii) Social Networking

5. Explain any ***five*** of the following with the help of an example or a diagram, wherever required : *5 x 4=20*

(a) Security Threats on Internet

(b) TCP/IP Model

(c) Object-Oriented Programming Language

(d) Perverse Software

(e) Subroutine and Functions

(f) Memory Hierarchy

(g) Classification of Printers

(h) Features of Spreadsheet Software

Solutions:

1. (a) Perform the following operations :

- **(i) Convert $(235)_{10}$ to binary**
- **(ii) Convert $(10{\cdot}3750)_{10}$ to binary**
- **(iii) Convert $(1011101)_2$ to decimal**
- **(iv) Convert $(FABC)_{16}$ to binary**
- **(v) Convert $(A5)_{16}$ to decimal**

Ans i. Convert $(235)_{10}$ to binary

Step 1: 235 ÷ 2 = 117 with a remainder of 1
Step 2: 117 ÷ 2 = 58 with a remainder of 1
Step 3: 58 ÷ 2 = 29 with a remainder of 0
Step 4: 29 ÷ 2 = 14 with a remainder of 1
Step 5: 14 ÷ 2 = 7 with a remainder of 0
Step 6: 7 ÷ 2 = 3 with a remainder of 1
Step 7: 3 ÷ 2 = 1 with a remainder of 1
Step 8: 1 ÷ 2 = 0 with a remainder of 1

Now, read the remainders from bottom to top: 11101011

So, (235)10 is equal to (11101011)2 in binary.

Ans ii. Convert $(10{\cdot}3750)_{10}$ to binary
Integer Part:
Step 1: 10 ÷ 2 = 5 with a remainder of 0
Step 2: 5 ÷ 2 = 2 with a remainder of 1
Step 3: 2 ÷ 2 = 1 with a remainder of 0
Step 4: 1 ÷ 2 = 0 with a remainder of 1

Now, read the remainders from bottom to top: (10)10 = (1010)2 in binary for the integer part.

Fractional Part:
Step 1: 0.3750 * 2 = 0.7500 (Write down the integer part, 0)
Step 2: 0.7500 * 2 = 1.5000 (Write down the integer part, 1)
Step 3: 0.5000 * 2 = 1.0000 (Write down the integer part, 1)

Since the fractional part becomes 0, we stop the process.

Now, combine the binary representation of the integer and fractional parts: (10.3750)10 = (1010.011)2 in binary.

Ans iii. Convert $(1011101)_2$ to decimal

To convert the binary number (1011101)2 to decimal, you can use the positional numeral system. Each digit in a binary number represents a power of 2.

Starting from the rightmost digit (the least significant bit) and moving left, you can multiply each digit by the corresponding power of 2 and then sum the results.

Let's calculate it step by step:

(1011101)2 = (1 * 2^6) + (0 * 2^5) + (1 * 2^4) + (1 * 2^3) + (1 * 2^2) + (0 * 2^1) + (1 * 2^0)

Now, calculate the powers of 2:

2^6 = 64
2^5 = 32
2^4 = 16
2^3 = 8
2^2 = 4
2^1 = 2
2^0 = 1

And substitute the values back into the equation:

(1 * 64) + (0 * 32) + (1 * 16) + (1 * 8) + (1 * 4) + (0 * 2) + (1 * 1) = 64 + 0 + 16 + 8 + 4 + 0 + 1 = 93

Therefore, (1011101)2 = (93)10 in decimal.

Ans iv: Convert $(FABC)_{16}$ to binary

To convert the hexadecimal number (FABC)16 to binary, you can use the process of converting each hexadecimal digit to its equivalent 4-bit binary representation.

Here's the conversion of each hexadecimal digit to binary:

F (in hexadecimal) = 1111 (in binary)
A (in hexadecimal) = 1010 (in binary)
B (in hexadecimal) = 1011 (in binary)
C (in hexadecimal) = 1100 (in binary)

Now, concatenate the binary representations of each hexadecimal digit:

(FABC)16 = (1111 1010 1011 1100)2 in binary.

Therefore, (FABC)16 = (1111101010111100)2 in binary.

Ans v. Convert $(A5)_{16}$ to decimal
To convert the hexadecimal number (A5)16 to decimal, you can use the positional numeral system. Each digit in a hexadecimal number represents a power of 16.

Starting from the rightmost digit (the least significant digit) and moving left, you can multiply each digit by the corresponding power of 16 and then sum the results.

Here's how you can do it step by step:

(A5)16 = (10 * 16^1) + (5 * 16^0)

Now, calculate the powers of 16:

16^1 = 16
16^0 = 1

And substitute the values back into the equation:

(10 * 16) + (5 * 1) = 160 + 5 = 165

Therefore, (A5)16 = (165)10 in decimal.

1.b: What will be the storage capacity of a 2·5 inch diameter disk pack having 4 plates with each surface of the plate having 2048 tracks and each track having 512 sectors? A sector can store 1024 bytes of data.

Ans: To calculate the storage capacity of the disk pack, we need to consider the number of plates, tracks per surface, sectors per track, and the data capacity of each sector.

Given:
- Diameter of the disk pack: 2.5 inches
- Number of plates: 4
- Tracks per surface: 2048
- Sectors per track: 512
- Data capacity of each sector: 1024 bytes

Let's calculate the storage capacity:

1. Calculate the total number of tracks on all surfaces:
Total Tracks = Number of Plates × Tracks per Surface
Total Tracks = 4 × 2048 = 8192 tracks

2. Calculate the total number of sectors on each plate:
Total Sectors per Plate = Tracks per Surface × Sectors per Track
Total Sectors per Plate = 2048 × 512 = 1048576 sectors

3. Calculate the total number of sectors on all plates:
Total Sectors = Number of Plates × Total Sectors per Plate
Total Sectors = 4 × 1048576 = 4194304 sectors

4. Calculate the total storage capacity in bytes:
Total Storage Capacity = Total Sectors × Data capacity per Sector
Total Storage Capacity = 4194304 × 1024 = 4294967296 bytes

Now, let's convert the total storage capacity to more readable units:

1 kilobyte (KB) = 1024 bytes
1 megabyte (MB) = 1024 kilobytes
1 gigabyte (GB) = 1024 megabytes

Total Storage Capacity = 4294967296 bytes ÷ 1024 bytes/KB ÷ 1024 KB/MB ÷ 1024 MB/GB ≈ 4 GB

So, the storage capacity of the 2.5-inch diameter disk pack with 4 plates, 2048 tracks per surface, 512 sectors per track, and each sector storing 1024 bytes of data is approximately 4 gigabytes (GB).

1.(C): Explain the von Neumann Architecture with the help of a diagram.

Ans: The Von Neumann architecture, also known as the Princeton architecture, is a theoretical framework for designing and constructing digital computers. It was proposed by the mathematician and computer scientist John von Neumann in the 1940s. The architecture is characterized by its use of a single shared memory for both data and instructions, which allows instructions to be treated as data and vice versa. This feature, along with its other components, forms the basis for most modern computers.

Here's an explanation of the Von Neumann architecture along with a simple diagram:

1. Components of Von Neumann Architecture

Central Processing Unit (CPU): The CPU is the "brain" of the computer, responsible for executing instructions and performing calculations.

Memory: A single shared memory stores both data and instructions. This memory is divided into memory cells, each holding a fixed amount of data or an instruction.

Control Unit: The control unit is responsible for fetching instructions from memory, decoding them, and coordinating the execution of operations.

Arithmetic and Logic Unit (ALU): The ALU performs arithmetic operations (addition, subtraction, etc.) and logical operations (AND, OR, NOT) required for computation.

Input/Output (I/O) devices: These devices facilitate communication between the computer and the external world. Examples include keyboards, mice, displays, and storage devices.

2. The Von Neumann Cycle:

The Von Neumann architecture follows a specific sequence of steps known as the "Von Neumann Cycle" for processing instructions. It consists of the following steps:

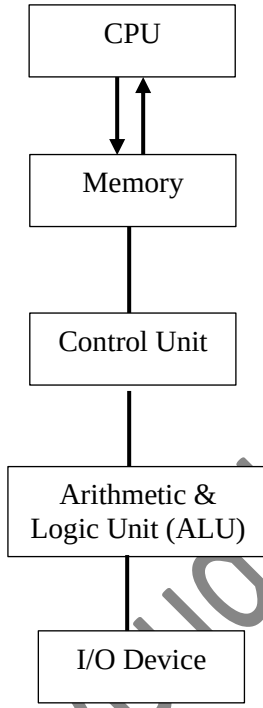
Fetch: The control unit fetches an instruction from memory at the address pointed by the program counter (PC).

Decode:The fetched instruction is then decoded to determine the operation to be performed.

Execute: The ALU and other components carry out the operation specified by the instruction.

Write Back: The results of the execution may be stored back in memory or registers, depending on the instruction.

3. Diagram of Von Neumann Architecture:



In the diagram, the CPU is connected to the memory, control unit, ALU, and I/O devices. The control unit coordinates the flow of data and instructions between the CPU and memory, and the ALU performs arithmetic and logical operations as directed by the control unit. The I/O devices enable data to be input into and output from the computer.

The Von Neumann architecture's simplicity and versatility have made it the foundation of most modern computers. However, it does have some limitations, such as the potential for bottlenecks when accessing shared memory and the inability to execute multiple instructions simultaneously. Modern computer architectures, such as the Harvard architecture and pipelining, have been developed to address these limitations and optimize computer performance further.

1.d :Explain two features of the software that will be needed for each of the following operations:

1. **Keeping track of files and directories.**
2. **Translating high level language program to machine language.**
3. **Identify and remove computer virus.**

Ans:

1. Keeping track of files and directories

To efficiently keep track of files and directories, software systems often incorporate various features designed to manage file organization and access. Here are two important features commonly found in such software:

1. **File System Hierarchy:** One essential feature is the implementation of a hierarchical file system structure. This allows files and directories to be organized in a tree-like fashion, where each directory can contain multiple files and subdirectories. The top-level directory is typically referred to as the root directory. Subdirectories can further contain files and additional subdirectories, creating a nested structure.

This hierarchical approach simplifies file management, as users can easily navigate through directories to locate and access specific files. Each file and directory is assigned a unique path from the root directory, enabling straightforward identification and retrieval.

2. **File Metadata and Attributes:** To keep track of files and directories effectively, the software maintains file metadata and attributes. Metadata refers to information about the file or directory that is not part of its actual content but provides essential details about it. Common metadata includes the file's name, size, creation date, modification date, and file type (e.g., text, image, executable).

Additionally, files can have various attributes that define their behavior or usage. For example:

- Read-Only: Indicates that the file can only be read but not modified.
- Hidden: Flags the file as hidden from regular user visibility.
- Archive: Indicates that the file has been modified and needs to be backed up.

Storing and managing metadata and attributes allow the software to efficiently search for files based on specific criteria, track file changes, and enforce access control.

Together, these features ensure the proper organization, retrieval, and management of files and directories, promoting efficient data storage and easy access for users and applications. These capabilities are essential for the smooth functioning of file systems in modern computing environments.

2. Translating high level language program to machine language.

Translating a high-level language program to machine language is a crucial task performed by compilers and interpreters. To achieve this translation, the software needs to implement specific features to handle the process effectively. Here are two essential features:

1. **Lexer (Tokenizer) and Parser:**
- Lexer (Tokenizer): The first step in translating a high-level language program is breaking down the source code into individual tokens or lexemes. This process is performed by a component called the lexer or tokenizer. The lexer scans the source code character by character and identifies meaningful units such as keywords, identifiers, operators, and literals. It generates a stream of tokens that represent these units, which are then passed to the parser for further processing.

- Parser: Once the lexer generates the token stream, the parser takes over. The parser analyzes the token stream according to the rules of the language's grammar and syntax. It constructs a parse tree or an abstract syntax tree (AST) to represent the program's syntactic structure. The parse tree or AST represents how the different parts of the program relate to each other. This tree-like structure is used for further analysis and translation into machine language.

2. **Code Generation and Optimization:**
- Code Generation: After the parsing phase, the software moves on to the code generation stage. In this step, the software translates the abstract representation of the program (e.g., parse tree or AST) into

machine code instructions. The code generator needs to handle various aspects, such as managing registers, memory allocation, instruction selection, and generating appropriate machine instructions based on the target hardware architecture.

- Optimization: During code generation, the software can apply various optimization techniques to improve the efficiency and performance of the generated machine code. These optimizations aim to produce code that executes faster or uses fewer resources. Some common optimizations include constant folding, loop unrolling, dead code elimination, and register allocation. By applying these optimizations, the translated machine code can execute more efficiently, resulting in better overall performance of the program.

These two features, lexer/parser for syntax analysis and code generation/optimization for producing efficient machine code, are vital components of a compiler or interpreter responsible for translating high-level language programs into machine language. They ensure that the resulting machine code accurately represents the original high-level program and is optimized for better execution on the target hardware.

3. Identify and remove computer virus

Identifying and removing computer viruses is a critical task performed by antivirus software. To effectively accomplish this, antivirus software incorporates specific features to detect and eliminate viruses. Here are two essential features:

1. **Virus Signature Database:**
- Virus Signature: A virus signature is a unique fingerprint or pattern that identifies a specific virus. It is essentially a sequence of bytes that is characteristic of a particular virus variant. When a new virus is discovered, security researchers analyze its code and behavior to generate a signature for it.
- Virus Signature Database: Antivirus software maintains a vast database of known virus signatures. This database is regularly updated to include signatures of newly discovered viruses. When the antivirus scans a file or the system, it compares the content against the signatures in its database.

If a match is found, it identifies the file or part of the system as infected with a specific virus.

2. **Heuristic Analysis:**

- Heuristic Analysis: While the signature-based approach is effective against known viruses, it may not catch new, previously unknown viruses (zero-day threats) for which no signatures exist. To address this limitation, antivirus software employs heuristic analysis. Heuristic analysis involves examining the behavior and characteristics of files or code to identify potential malware even without a specific signature.
- Behavior Monitoring: Antivirus software may monitor the behavior of running processes, applications, and system activities. If a program exhibits suspicious behavior, such as attempting to modify multiple files simultaneously or executing unauthorized operations, the heuristic analysis may flag it as potentially malicious.
- Code Emulation: Antivirus software may use code emulators to analyze the behavior of unknown or suspicious code in a controlled environment. The emulator executes the code in a sandboxed environment, monitoring its actions without allowing it to affect the actual system. If the code exhibits behavior typical of malware, the antivirus may take appropriate actions to quarantine or remove it.

By combining the virus signature database for known threats and heuristic analysis to detect new or unknown threats, antivirus software can effectively identify and remove computer viruses. These features are essential in keeping computer systems safe from various malware threats and ensuring a secure computing environment.

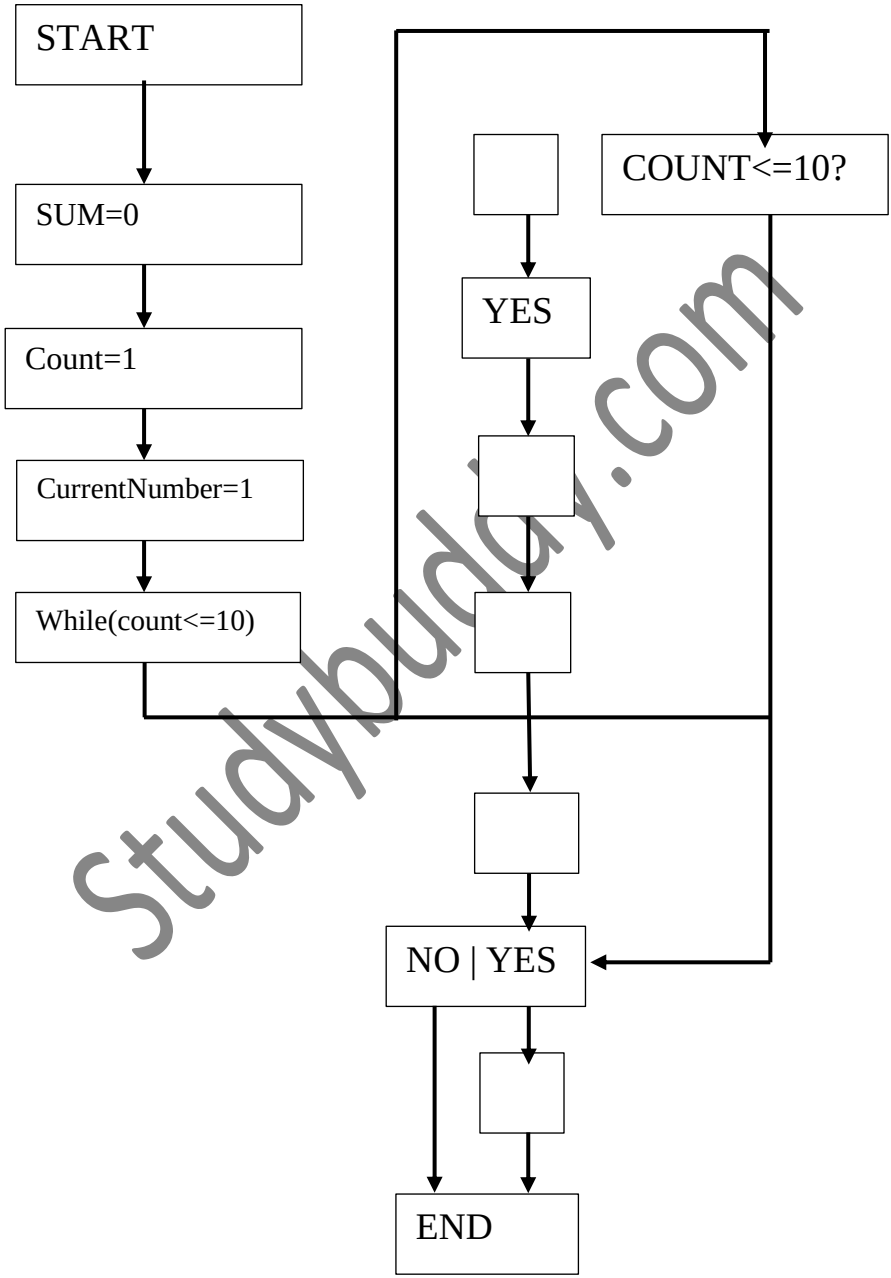
1. **E: Write an algorithm and draw the flowchart for finding the sum of the first 10 odd numbers**.

Ans: The algorithm and a flowchart to find the sum of the first 10 odd numbers:

Algorithm:
1. Initialize a variable `sum` to 0 to store the sum of odd numbers.
2. Initialize a variable `count` to 1 to keep track of the number of odd numbers found.
3. Initialize a variable `currentNumber` to 1, which represents the current odd number to be added to the sum.

4. While `count` is less than or equal to 10, do steps 5-6.
5. Add `currentNumber` to `sum`.
6. Increment `currentNumber` by 2 (to get the next odd number) and increment `count` by 1.
7. Display the value of `sum` as the result.

Flowchart:



The flowchart uses the convention that a diamond shape represents a decision point (a condition to be checked), a rectangle represents a process or action, and the rounded rectangle represents the start or end of the flowchart. The arrows indicate the flow of the algorithm based on the conditions evaluated in the decision points.

1 f. Given the following IP addresses and Subnet mask, find the Net-ID :

(i). IP address 10.1.5.7 with subnet mask 255.0.0.0

(ii). IP address 192.168.1.05 with subnet mask 255.255.255.0

Ans(i): IP address 10.1.5.7 with subnet mask 255.0.0.0

To find the Net-ID (Network ID) for the given IP address with the given subnet mask, you need to perform a bitwise AND operation between the IP address and the subnet mask. This operation will give you the network portion of the IP address.

Step 1: Convert the IP address and subnet mask to binary form:
IP address: 10.1.5.7 => 00001010.00000001.00000101.00000111
Subnet mask: 255.0.0.0 => 11111111.00000000.00000000.00000000

Step 2: Perform a bitwise AND operation:

IP address: 00001010.00000001.00000101.00000111
Subnet mask: 11111111.00000000.00000000.00000000
Net-ID: 00001010.00000000.00000000.00000000

Step 3: Convert the binary Net-ID back to decimal form:
Net-ID: 10.0.0.0

So, the Net-ID for the IP address 10.1.5.7 with a subnet mask of 255.0.0.0 is 10.0.0.0.

Ans(ii). IP address 192.168.1.05 with subnet mask 255.255.255.0

To find the Net-ID (Network ID) for the given IP address with the given subnet mask, you need to perform a bitwise AND operation between the IP address and the subnet mask. This operation will give you the network portion of the IP address.

Step 1: Convert the IP address and subnet mask to binary form:
IP address: 192.168.1.5 => 11000000.10101000.00000001.00000101
Subnet mask: 255.255.255.0 => 11111111.11111111.11111111.00000000

Step 2: Perform a bitwise AND operation:
IP address: 11000000.10101000.00000001.00000101
Subnet mask: 11111111.11111111.11111111.00000000
Net-ID: 11000000.10101000.00000001.00000000

Step 3: Convert the binary Net-ID back to decimal form:
Net-ID: 192.168.1.0

So, the Net-ID for the IP address 192.168.1.5 with a subnet mask of 255.255.255.0 is 192.168.1.0.

1. (g). Explain the purpose of the following Networking devices.
(i) Network Interface Card
(ii) Modem
(iii) Repeater

Ans (i). Network Interface Card

The Network Interface Card (NIC), also known as a network adapter or network interface controller, is a hardware component that serves as the interface between a computer and a computer network. The primary purpose of a NIC is to enable communication between the computer and the network, allowing the computer to send and receive data over the network.

Here are the main purposes and functions of a Network Interface Card:

1. **Connectivity**: The NIC provides the physical connection between the computer and the network medium, such as Ethernet cables or wireless signals. It allows the computer to be part of a local area network (LAN) or connect to the internet.

2. **Data Link Layer Support**: The NIC handles the low-level data link layer functions, such as framing data into packets, adding MAC (Media Access Control) addresses, and error detection, as specified by protocols like Ethernet.

3. **Data Transmission and Reception**: The NIC takes data from the computer's CPU, formats it into packets, and transmits it onto the network medium. Similarly, it receives incoming data packets from the network, processes them, and delivers the data to the computer's CPU.

4. **MAC Address Assignment**: Each NIC is assigned a unique MAC address that identifies it on the network. The NIC is responsible for appending the source MAC address to outgoing data packets and filtering incoming packets based on their destination MAC address.

5. **Buffering**: The NIC typically has a small buffer or memory that temporarily stores incoming and outgoing data. This buffer helps manage data flow and prevents data loss in case of momentary network congestion.

6. **Transmission Control**: The NIC manages the flow of data transmission, ensuring that data is sent at an appropriate rate to avoid overwhelming the network or causing collisions.

7. **Device Driver Interaction**: The NIC requires a device driver, a software component that acts as an interface between the operating system and the NIC. The device driver allows the operating system to communicate with and control the NIC effectively.

8. **Hardware Offloading**: Modern NICs often include hardware offloading features, which enable the NIC to perform specific networking tasks, such as TCP checksum calculation or segmentation offloading, directly in hardware, reducing the CPU's workload.

Overall, the Network Interface Card plays a crucial role in enabling network communication for computers and other devices, allowing them to participate in data exchange within a network and facilitating access to the broader internet. It serves as the bridge between the physical network infrastructure and the computer's operating system and applications.

Ans (ii). Modem

The term "modem" is short for "modulator-demodulator." A modem is a communication device that serves the primary purpose of converting digital data from a computer or other digital device into analog signals suitable for transmission over analog communication lines, such as telephone lines. It also performs the reverse process of converting incoming analog signals back into digital data for reception by the digital device. The primary functions and purposes of a modem are as follows:

1. **Digital-to-Analog Conversion (Modulation)**: The modem takes digital data generated by computers and other digital devices (such as routers or network switches) and converts it into analog signals. This process is called modulation. The analog signals are then suitable for transmission over analog communication channels, which were historically used for voice communication but can also carry digital data.

2. **Analog-to-Digital Conversion (Demodulation)**: When the analog signals carrying data reach their destination (such as another modem or a central network node), the modem on the receiving end demodulates these analog signals. It converts the analog signals back into digital data that the digital device can understand and process.

3. **Facilitating Data Transmission over Phone Lines**: Modems were historically widely used to transmit data over regular telephone lines, allowing computers to connect to the internet or communicate with each other over long distances. They were especially prevalent during the early days of the internet, before broadband technologies like DSL and cable modems became widespread.

4. **Connecting to Remote Networks**: Modems have been used to establish remote connections to networks or systems located in remote

areas where other forms of connectivity, such as fiber optics or broadband, were not available or practical.

5. **Various Types of Modems**: There are several types of modems, including dial-up modems, cable modems, DSL modems, and cellular modems. Each type is designed to work with specific types of communication channels, such as telephone lines, cable TV networks, digital subscriber lines (DSL), or cellular networks.

6. **Bridging Digital and Analog Networks**: Modems acted as a bridge between digital devices (such as computers) and analog communication infrastructure. This allowed digital devices to communicate over analog channels when digital network infrastructure was not widely available.

7. **Legacy Devices**: While modems are less commonly used today for internet access due to the prevalence of broadband technologies, they are still used in certain scenarios, such as in remote areas with limited connectivity options or in industrial applications that require reliable communication over legacy systems.

Overall, the purpose of a modem has been to enable digital communication over analog channels, facilitating data transmission between computers and other digital devices over telephone lines and similar communication mediums. As technology has advanced, the use of traditional modems for internet access has decreased, but they remain essential for specific applications and areas with limited connectivity options.

Ans (iii). Repeater

A repeater is a fundamental network device designed to extend the range and reach of a network by regenerating and retransmitting signals. As data travels over a network medium, such as copper cables or optical fibers, it experiences attenuation, resulting in a decrease in signal strength. This can lead to data loss or corruption over long distances.

The primary purpose of a repeater is to counteract this attenuation by amplifying the weakened signals, thus allowing them to travel further without loss of data integrity. When a repeater receives a weak signal, it

cleans it of any noise or distortion and then boosts its power before retransmitting it along the network.

Repeaters are especially crucial in wired networks, where the distance limitations of the physical medium can impact the network's coverage area. By strategically placing repeaters along the network, administrators can effectively extend the reach of the network infrastructure, connecting devices that are located farther apart.

In wireless networks, repeaters are also utilized to enhance coverage. Wireless repeaters receive wireless signals, amplify them, and then retransmit them to extend the range of the wireless network. This can be particularly beneficial in large buildings, outdoor spaces, or areas with obstacles that weaken or block wireless signals.

In summary, the purpose of a repeater is to overcome signal degradation and extend the effective range of a network. By amplifying and retransmitting signals, repeaters ensure smooth and reliable data transmission over extended distances, enhancing the overall performance and coverage of both wired and wireless networks.

1.(h). List any six advantages of e-learning.

Ans: E-learning, which refers to the use of electronic technologies to deliver educational content and training, offers numerous advantages that have made it increasingly popular in recent years. Here are six key advantages of e-learning:

1. **Flexibility and Convenience**: E-learning allows learners to access educational materials and courses from anywhere and at any time. This flexibility enables individuals to study at their own pace, accommodating busy schedules and diverse learning styles. Learners can access the content on various devices, such as computers, tablets, or smartphones, providing convenience and accessibility.

2. **Cost-Effectiveness**: Compared to traditional classroom-based training, e-learning often proves to be more cost-effective. It eliminates expenses associated with travel, accommodation, classroom facilities, and

printed materials. Organizations can save on training costs while reaching a larger audience with the same resources.

3. **Customization and Personalization**: E-learning platforms can tailor content to meet individual learners' needs and preferences. Learners can choose their learning paths, focus on specific topics, and revisit materials as needed. This personalized approach enhances engagement and comprehension, leading to more effective learning outcomes.

4. **Scalability and Reach**: E-learning enables organizations and educational institutions to scale their training programs to a vast number of learners, regardless of geographical location. It is especially valuable for multinational companies or academic institutions with a diverse student population.

5. **Continuous Learning and Accessibility**: E-learning allows for continuous learning, as materials are available 24/7. Learners can access resources whenever they need to refresh their knowledge or learn about new developments in their field. Additionally, e-learning can be made accessible to individuals with disabilities, promoting inclusive education.

6. **Engaging Multimedia Content**: E-learning platforms often employ multimedia elements such as videos, animations, interactive quizzes, and gamification techniques. These engaging elements enhance learner interest and motivation, leading to a more enjoyable and effective learning experience.

Overall, e-learning's advantages lie in its flexibility, cost-effectiveness, customization, reach, accessibility, and engaging content. As technology continues to advance, e-learning is likely to play an even more significant role in education and professional development, empowering learners worldwide to acquire knowledge and skills efficiently.

1(i). List two advantages and one disadvantage of using Inkjet Printer.

Ans: Advantages of Inkjet Printer:
1. **High-Quality Printing**: Inkjet printers are known for producing high-quality prints, especially for documents, images, and photographs. They can achieve vibrant colors and sharp text, making them suitable for

various printing needs, including professional documents and photo printing.

2. **Affordability and Versatility**: Inkjet printers are generally more affordable than other types of printers, such as laser printers. They are suitable for home and small office use, as well as for printing photos, posters, brochures, and other creative projects. Additionally, they can handle different types of paper and materials, allowing for printing on various media.

Disadvantage of Inkjet Printer:

1. **Printing Speed**: One of the primary disadvantages of inkjet printers is their relatively slower printing speed compared to laser printers. The inkjet printing process involves spraying tiny droplets of ink onto the paper, which takes time to create the final image or text. For large volume printing or high-speed document production, laser printers might be more efficient.

2 (a). Define the term Instruction in the context of a computer processor. Explain the role of control unit for execution of an instruction.

Ans: In the context of a computer processor, an instruction is a basic operation or command that is executed by the central processing unit (CPU). It represents a specific task or operation that the CPU needs to perform to carry out a program's instructions or process data. Instructions are represented in binary form (machine code) and are fetched from memory by the CPU for execution.

The control unit is a crucial component of the CPU responsible for managing the execution of instructions. Its main role is to coordinate and control the flow of data and instructions within the CPU, ensuring that each instruction is executed in the correct sequence and at the appropriate time. The control unit performs the following tasks:

1. **Instruction Fetch**: The control unit fetches the next instruction from memory, reading it as binary code, and sends it to the instruction decoder.

2. **Instruction Decoding**: The instruction decoder interprets the binary code and identifies the type of operation the instruction represents, such as arithmetic, logic, data transfer, or branching.

3. **Execution Cycle**: The control unit initiates the execution of the instruction by coordinating the necessary resources and components within the CPU. It activates the relevant arithmetic logic unit (ALU) and other functional units required to perform the specific operation.

4. **Data Movement**: The control unit manages the movement of data between various registers, cache, and memory locations, ensuring that data is accessed and manipulated correctly during the instruction execution.

5. **Sequencing**: The control unit maintains the instruction sequencing, ensuring that instructions are executed in the correct order and that the appropriate data dependencies are respected.

6. **Branching and Control Flow**: The control unit handles branching instructions that change the flow of program execution based on specific conditions, such as conditional jumps or loops.

7. **Timing and Synchronization**: The control unit is responsible for maintaining the proper timing and synchronization of various components within the CPU, ensuring that instructions are executed at the correct pace and that data is processed accurately.

In summary, the control unit plays a vital role in the execution of instructions within a computer processor. It manages the instruction fetch-decode-execute cycle, coordinates data movement and control flow, and ensures that instructions are executed in the correct sequence to carry out the desired tasks and operations of a computer program.

2(b) Differentiate between the following :

(i) Static RAM and Dynamic RAM

(ii) RAM and ROM

(iii) Hard disk and Magnetic tapes

(iv) DVD and CD

Ans (i). Static RAM and Dynamic RAM.
Static RAM (SRAM) and Dynamic RAM (DRAM) are two common types of memory used in computer systems:

1. **Storage Technology**: SRAM uses flip-flops to store each bit of data, making it faster and more reliable but also more expensive and power-hungry. DRAM, on the other hand, uses capacitors to store data, making it cheaper but also slower and less power-efficient.

2. **Data Retention**: SRAM retains data without the need for constant refreshing, making it faster for random access. DRAM requires regular refreshing due to the charge leakage from capacitors, leading to slightly slower access times.

In summary, SRAM provides faster and more reliable access, while DRAM is cheaper but slower and requires periodic refreshing for data retention.

Ans (ii). RAM and ROM

RAM (Random Access Memory) and ROM (Read-Only Memory) are two types of computer memory with distinct characteristics:

1. **Read/Write vs. Read-Only**:
 - RAM is a volatile memory, which means it can read from and written to. It is used to temporarily store data and program instructions that the CPU needs for immediate processing. Data stored in RAM is lost when the computer is powered off.
 - ROM, on the other hand, is a non-volatile memory that is primarily used to store firmware and other essential data that needs to be permanently retained. It is read-only, meaning data can be read from it, but it cannot be written or modified.

2. **Data Retention**:
 - RAM requires continuous power to retain data. When the power supply is interrupted, the data stored in RAM is lost. This characteristic is known as volatility.

- ROM, being non-volatile, retains data even when the power is turned off. It stores critical boot-up instructions, system firmware, and other essential data that are necessary for the computer's operation.

3. **Purpose**:
- RAM is used for active data storage during the computer's operation. It stores the currently running programs, open files, and data that the CPU needs to access quickly for processing tasks.
- ROM contains firmware and system-level data necessary for the computer's boot-up process and initial configuration. It also holds basic input/output system (BIOS) settings.

4. **Accessibility**:
- RAM provides fast random access to data, allowing the CPU to quickly retrieve and modify information.
- ROM is designed for read-only access. It provides the necessary data during the boot-up process but does not support writing or modification.

In summary, RAM is volatile memory used for temporary data storage during the computer's operation, while ROM is non-volatile memory used to store essential data and firmware needed for the computer's startup and initial configuration.

Ans (iii). Hard disk and Magnetic tapes

Hard disks and magnetic tapes are both types of magnetic storage media, but they have several differences in terms of usage, speed, access methods, and storage capacity:

1. **Usage**:
- Hard Disk: Hard disks are commonly used as primary storage devices in computers and laptops. They provide fast access to data and are suitable for frequently accessed files and applications.
- Magnetic Tapes: Magnetic tapes are typically used for backup and long-term archival purposes. They are more suitable for storing large amounts of data that may not require frequent access.

2. **Speed**:

- Hard Disk: Hard disks offer faster data access and retrieval times compared to magnetic tapes. They have low seek times and rotational latency, making them suitable for real-time data access.
- Magnetic Tapes: Magnetic tapes have relatively slower data access speeds. Accessing data on tapes involves physically moving the tape to the desired location, which takes more time than seeking data on a hard disk.

3. **Access Method**:
- Hard Disk: Hard disks use direct access storage methods, allowing the computer to access data at any location on the disk directly. This random-access feature makes them ideal for quick data retrieval.
- Magnetic Tapes: Magnetic tapes use sequential access methods, which means data is accessed sequentially from the beginning to the desired location. Finding specific data on tapes can take longer due to this sequential access pattern.

4. **Storage Capacity**:
- Hard Disk: Hard disks offer smaller storage capacities compared to modern magnetic tapes. Although hard disks can have large capacities, magnetic tapes can typically store much more data, making them ideal for data backup and archival purposes.

5. **Durability and Portability**:
- Hard Disk: Hard disks are more delicate and susceptible to damage from physical shocks or drops. They are relatively less portable compared to tapes.
- Magnetic Tapes: Magnetic tapes are more durable and robust. They can withstand rough handling and are more suitable for secure, off-site data storage and transportation.

In summary, hard disks are faster, provide random access, and are commonly used as primary storage devices in computers. Magnetic tapes, on the other hand, are slower, use sequential access, and are more suitable for data backup and long-term archival storage due to their larger capacity and portability.

Ans (iv). DVD and CD

DVD (Digital Versatile Disc) and CD (Compact Disc) are optical storage media with several key differences:

1. **Storage Capacity**: DVDs have a higher storage capacity than CDs. A standard single-layer DVD can hold up to 4.7 GB of data, while a standard CD can store up to 700 MB of data. Dual-layer DVDs can store even more, up to 8.5 GB.

2. **Usage**: DVDs are often used for storing large video files, movies, and software applications due to their higher capacity. CDs are commonly used for audio recordings, software distribution, and data backup.

3. **Data Access**: DVDs use a narrower track pitch than CDs, allowing for higher data density. This enables faster data access and retrieval on DVDs compared to CDs.

4. **Laser Wavelength**: DVDs use a shorter wavelength laser (typically 650 nm) for reading data, while CDs use a longer wavelength laser (typically 780 nm).

In summary, DVDs offer higher storage capacity, are used for larger video and software files, have faster data access, and utilize a shorter wavelength laser compared to CDs. CDs are commonly used for audio and basic data storage.

2 (c). What is the role of a port in a computer ? Explain the use of (i) Parallel port, and (ii) Serial port in a computer.

Ans: A port in a computer refers to a hardware interface that enables communication between the computer and external devices. Ports serve as connection points through which data can be sent and received, allowing the computer to interact with various peripherals and expansion devices. They play a crucial role in expanding the functionality and versatility of a computer system.

(i) **Parallel Port**:
A parallel port is a type of port that was commonly used in older computer systems for connecting peripherals like printers and scanners. It transfers data in parallel, meaning multiple bits of data are sent simultaneously over separate data lines. The primary characteristics and use of the parallel port are as follows:

- **Data Transfer**: Parallel ports are capable of transferring multiple bits of data simultaneously, which made them suitable for devices requiring high-speed data transfer, such as printers.

- **Printers and Scanners**: The most common use of parallel ports was to connect printers and scanners to the computer. Printers required fast data transfer to print documents quickly, and parallel ports provided the necessary throughput.

- **Outdated Technology**: With the advancement of USB (Universal Serial Bus) and other faster interfaces, parallel ports have become outdated. Newer computers and devices no longer include parallel ports, and many modern printers and scanners use USB or wireless connections instead.

(ii) **Serial Port**:
A serial port is another type of port used for data transfer between a computer and external devices. Unlike parallel ports, serial ports transfer data sequentially, one bit at a time. Here's how serial ports are used in a computer:

- **Data Transfer**: Serial ports are suitable for devices that require slower data transfer rates but have a more extended communication range. They are commonly used for peripherals like modems, mice, and some types of industrial equipment.

- **Mice and Modems**: In the past, serial ports were commonly used to connect mice to computers. Many older modems also

used serial ports for communication with the computer to access the internet.

- **Industrial Applications**: Serial ports are still widely used in industrial settings, where they are employed to communicate with various devices, such as sensors, controllers, and other equipment.

- **Limitations**: Serial ports have relatively slower data transfer rates compared to modern interfaces like USB, limiting their use in consumer devices where speed is essential.

In summary, ports in a computer are hardware interfaces that facilitate communication with external devices. The parallel port was used for high-speed data transfer with printers and scanners but has become outdated. Serial ports, on the other hand, are still used in specific applications, such as industrial settings, for devices that require slower data transfer rates but extended communication ranges.

3.(a). Explain the terms client and server in the context of client/server architecture. Explain the three-tier client/server architecture with the help of a diagram.

Ans: In the context of client/server architecture, the terms "client" and "server" refer to the two main components of a distributed computing model. This model is used to facilitate communication and data exchange between multiple computers over a network.

1. **Client**:
A client is a user-facing component or software application that requests services or data from a server. It typically runs on end-user devices such as computers, smartphones, or tablets. The client initiates communication by sending requests to the server, and it waits for the server's response to fulfill its needs. Clients are responsible for presenting data and results to users in a user-friendly manner.

2. **Server**:
A server is a powerful computer or software application that provides services, resources, or data to clients upon request. Servers have high processing capabilities and are designed to handle multiple client requests simultaneously. They run in the background, waiting for incoming requests from clients, and respond with the required data or services.

Now, let's explain the three-tier client/server architecture:

The three-tier client/server architecture is a popular design pattern used in modern distributed systems. It divides the system into three logical layers, each responsible for specific tasks. The layers are as follows:

1. **Presentation Tier (Client Tier)**:
The presentation tier is the top layer that interacts directly with the end-users or clients. It consists of client-side applications that run on user devices and provide the user interface for data input and output. Clients send requests to the middle tier (application tier) for processing and data retrieval. Examples of presentation tier technologies include web browsers, mobile apps, and desktop applications.

2. **Application Tier (Middle Tier)**:
The application tier, also known as the middle tier, acts as an intermediary between the presentation tier and the data storage tier. It is responsible for processing client requests, business logic implementation, and retrieving data from the data storage tier. This tier contains application servers that execute the core logic of the system and manage the interaction between the presentation and data storage tiers.

3. **Data Storage Tier (Data Tier)**:
The data storage tier is the bottom layer responsible for storing and managing data. It comprises databases or data storage systems that hold and organize the application's data. The

application tier communicates with the data storage tier to retrieve or store data as per client requests.

Diagram of the Three-Tier Client/Server Architecture:

In this diagram, clients (user devices) interact with the application tier, which, in turn, interacts with the data storage tier to provide requested data or services. The three-tier architecture ensures a clear separation of concerns, making the system more scalable, maintainable, and flexible.

3. (b). What is an Open-source Software? List any two objectives of an Open-source movement. List the name and purpose of any four Open-source Software.

Ans: Open-source software (OSS) is computer software with source code that is made freely available to the public. It allows users to view, modify, and distribute the software's source code under licenses that promote collaboration, transparency, and community-driven development. In contrast to proprietary software, which restricts access to its source code and requires licensing fees, open-source software encourages collaboration and fosters a community of developers and users working together to improve and extend the software.

Objectives of the Open-source Movement:

1. **Freedom and Accessibility**: The open-source movement aims to promote freedom and accessibility in software usage. By

providing access to the source code, users have the freedom to study, modify, and redistribute the software as they see fit, enabling a more transparent and inclusive software development process.

2. **Collaboration and Innovation**: Another objective is to foster collaboration and innovation within the software community. Open-source projects invite contributions from developers around the world, encouraging them to collaborate, share ideas, and collectively improve the software's quality and functionality.

Examples of Open-source Software:

1. **Linux Operating System**: Linux is a popular open-source operating system that serves as an alternative to proprietary operating systems like Windows and macOS. It is widely used in servers, embedded systems, and desktop computers due to its stability, security, and flexibility.

2. **Apache Web Server**: The Apache HTTP Server, commonly known as Apache, is an open-source web server software that powers a significant portion of websites on the internet. It provides a robust and scalable platform for hosting websites and web applications.

3. **Mozilla Firefox**: Mozilla Firefox is an open-source web browser known for its speed, security, and extensive add-ons ecosystem. It is developed by a global community and offers an alternative to proprietary web browsers.

4. **LibreOffice**: LibreOffice is a free and open-source office suite that includes word processing, spreadsheet, presentation, and other productivity tools. It provides a cost-effective alternative to proprietary office suites.

Open-source software promotes a collaborative and community-driven approach to software development,

encouraging transparency, innovation, and accessibility. It has become an essential part of the modern technology landscape, powering critical infrastructure and empowering users with freedom and flexibility in software usage.

3.(c). Define the following in the context of an Operating System
(i) Batch Processing
(ii) Graphical User Interface
(iii) Multiprogramming
(iv) Time-Sharing System

Ans (i): Batch processing in the context of an operating system refers to a method of executing a series of predefined tasks or jobs without the need for immediate user interaction. These tasks are grouped together in a batch file or job control language (JCL) and submitted to the operating system for processing. The operating system processes the jobs one after the other, without requiring constant user input. Batch processing is commonly used for repetitive, resource-intensive, or time-consuming tasks, such as large-scale data processing, printing, or system backups, which can be scheduled and executed during off-peak hours for efficiency.

Ans (ii): A Graphical User Interface (GUI) in the context of an operating system is a visual interface that allows users to interact with the computer using graphical elements such as icons, windows, menus, buttons, and mouse pointers. It provides a user-friendly and intuitive way to access and control various functions and applications on the computer. GUIs enable users to perform tasks by simply clicking on icons or using the mouse to navigate through the system, making computing more accessible to users with little technical expertise. GUIs have become a standard feature in modern operating systems, enhancing the user experience and making computers more visually appealing and user-centric.

Ans (iii): Multiprogramming, in the context of an operating system, refers to a technique where multiple programs or processes are kept in main memory simultaneously and share the CPU for execution. The goal of multiprogramming is to maximize CPU utilization and overall system efficiency. When one program is waiting for I/O or other resources, the CPU is switched to another ready program, allowing for overlapping of computation and I/O operations. This helps to reduce idle time and enhances the system's throughput. Multiprogramming is a key feature in modern operating systems, enabling efficient multitasking and improved utilization of system resources.

Ans (iv): A Time-Sharing System, in the context of an operating system, is a technique that allows multiple users to access a single computer simultaneously and share its resources, including the CPU, memory, and peripherals. The system rapidly switches the CPU between different users' processes, providing each user with the illusion of having a dedicated system. Each user gets a small time slice or quantum to execute their tasks before the CPU is allocated to the next user in a round-robin fashion. Time-sharing systems enable interactive computing, facilitating multiple users to work concurrently, run their programs, and access data in real-time, making computing more interactive and efficient.

3(d). Given the values of three variables as x = 5, y = 8 and z = 13, what would be the output of the following expressions in C programming language?

(i) **x = = y**

(i) **(x + y) = = z**

(iii) **y < z**

(iv) **x ! = z**

Ans (i). x = = y

Ans: In C programming language, the expression `x == y` is used to check if the value of variable `x` is equal to the value of variable `y`. The double equals `==` is the equality operator, and it returns either true (1) if the condition is met or false (0) if the condition is not met.

Given the values of the variables:
x = 5
y = 8

Let's evaluate the expression `x == y`:

x == y // Is 5 equal to 8?

Since 5 is not equal to 8, the expression `x == y` evaluates to false (0).

So, the output of the expression `x == y` would be 0 (false) in the C programming language.

Ans (ii). (x + y) = = z

Ans: In the C programming language, the expression `(x + y) == z` is used to check if the sum of the values of variables `x` and `y` is equal to the value of variable `z`. The double equals `==` is the equality operator, and it returns either true (1) if the condition is met or false (0) if the condition is not met.

Given the values of the variables:
x = 5
y = 8
z = 13

Let's evaluate the expression `(x + y) == z`:

(x + y) == z // Is (5 + 8) equal to 13?

The sum of `x` and `y` is `5 + 8 = 13`. Since 13 is equal to 13, the expression `(x + y) == z` evaluates to true (1).

So, the output of the expression `(x + y) == z` would be 1 (true) in the C programming language.

Ans (iii). y < z

Ans: In the C programming language, the expression `y < z` is used to check if the value of variable `y` is less than the value of variable `z`. The less than operator `<` returns true (1) if the condition is met (y is less than z), or false (0) if the condition is not met.

Given the values of the variables:
x = 5
y = 8
z = 13

Let's evaluate the expression `y < z`:

y < z // Is 8 less than 13?

Since 8 is indeed less than 13, the expression `y < z` evaluates to true (1).

So, the output of the expression `y < z` would be 1 (true) in the C programming language.

Ans (iv). x ! = z

Ans: In the C programming language, the expression `x != z` is used to check if the value of variable `x` is not equal to the value of variable `z`. The exclamation mark followed by the equals sign `!=` is the "not equal to" operator, and it returns true (1) if the condition is met (x is not equal to z), or false (0) if the condition is not met.

Given the values of the variables:
x = 5
y = 8
z = 13

Let's evaluate the expression `x != z`:

x != z // Is 5 not equal to 13?

Since 5 is indeed not equal to 13, the expression `x != z` evaluates to true (1).

So, the output of the expression `x != z` would be 1 (true) in the C programming language.

4. (a) Explain the terms in the context of Computer Network.

(i). Half Duplex
(ii). Channel
(iii). Packet Switching
(iv). Bandwidth

Ans (i): Half Duplex

In the context of computer networks, "half duplex" refers to a communication mode in which data transmission can occur in both directions (bi-directional) but not simultaneously. In a half duplex communication, the data can flow in either direction, but the communication channel is shared between the two communicating devices, allowing data transmission in one direction at a time.

Imagine a walkie-talkie as an analogy for half duplex communication. When one person speaks (transmits), the other person must listen (receive) before they can respond. Both parties cannot talk and listen simultaneously on the same channel, which is characteristic of half duplex communication.

Some key points about half duplex communication in computer networks:

1. **Shared Communication**: In half duplex mode, the communication channel is shared between the sending and receiving devices. The channel switches its direction of communication when data transmission changes from one device to the other.

2. **Collision Detection**: Half duplex communication requires a collision detection mechanism to identify and handle situations where multiple devices try to transmit simultaneously. When a collision occurs, the devices involved must stop transmitting, wait for a random period, and then reattempt the transmission.

3. **Examples**: Half duplex communication is commonly used in Ethernet networks using older technologies like 10BASE-T and 100BASE-TX, where data transmission is bidirectional but not simultaneous.

4. **Limitation**: Half duplex communication can introduce delays due to the necessity of switching between transmit and receive modes. It is also less efficient compared to full duplex communication, where data can flow simultaneously in both directions.

In contrast, full duplex communication allows data transmission in both directions simultaneously, eliminating the need for collision detection and providing higher data transfer rates and efficiency. Modern Ethernet networks often use full duplex communication, which has become more prevalent as network technologies have advanced.

Ans (ii): Channel

In the context of computer networks, a "channel" refers to the medium through which data is transmitted between devices. It is the physical path or logical connection that facilitates

communication between sender and receiver. Channels can be wired, such as copper cables (e.g., twisted-pair cables, coaxial cables) or optical fibers, or they can be wireless, such as radio waves or infrared signals. Each channel has its own characteristics, including bandwidth, data transfer rate, and susceptibility to interference. The choice of channel affects the efficiency and reliability of data transmission in a network, making it a critical consideration in network design and implementation.

Ans (iii): Packet Switching

Packet switching is a data transmission method used in computer networks, where data is divided into small packets before being sent across the network. Each packet contains a portion of the original data, along with addressing information for the source and destination. These packets are then independently routed through the network, taking different paths to reach the destination. At the receiving end, the packets are reassembled into the original data. Packet switching allows efficient utilization of network resources, as multiple packets can share the same communication channels simultaneously, enabling faster and more reliable data transmission compared to circuit-switched networks.

Ans(iv): Bandwidth In the context of computer networks, "bandwidth" refers to the maximum data transfer rate or capacity of a network communication channel. It represents the amount of data that can be transmitted over the network in a given period, usually measured in bits per second (bps) or megabits per second (Mbps). Bandwidth is a critical factor in determining the speed and efficiency of data transmission. Higher bandwidth allows for faster data transfer and reduced latency, enabling quicker access to web pages, smooth video streaming, and faster downloads. Bandwidth is influenced by the physical characteristics of the network medium and the technology used for data transmission, such as copper cables, optical fibers, or wireless signals.

4 (b). Explain the characteristics of Local Area Networks. How are LANs different from WANs ?

Ans: Characteristics of Local Area Networks (LANs):

1. **Limited Geographic Area**: LANs cover a limited geographic area, such as a single building, office, or campus. They are designed for small to medium-sized networks, typically spanning a few kilometers at most.

2. **High Data Transfer Rates**: LANs offer high data transfer rates, usually in the range of 10 Mbps to 1 Gbps or more. This allows for fast and efficient communication among devices within the network.

3. **Private Ownership**: LANs are privately owned and operated by organizations or individuals. They provide a secure and controlled environment for internal data communication.

4. **High Reliability**: LANs are known for their high reliability and low error rates since they operate within a confined environment, minimizing external interference.

5. **Ethernet Technology**: The most common LAN technology is Ethernet, which uses wired connections (such as twisted-pair cables) or wireless connections (Wi-Fi) to link devices together.

6. **Simple Network Topologies**: LANs typically use simple network topologies like star, bus, or ring configurations, making them easy to set up and manage.

Differences between LANs and WANs:

1. **Geographic Coverage**: The main difference lies in their geographic coverage. LANs cover a limited area like a building or campus, whereas WANs (Wide Area Networks) span large geographic regions, such as cities, countries, or even continents, connecting multiple LANs together.

2. **Data Transfer Rates**: LANs offer higher data transfer rates compared to WANs. WANs typically have lower data transfer rates due to the long distances and the use of public telecommunication links.

3. **Ownership**: LANs are privately owned and controlled by a single organization, while WANs often involve multiple organizations and are typically provided by telecommunication companies.

4. **Cost**: LANs are generally more cost-effective to set up and maintain since they cover smaller areas and use less expensive networking equipment. WANs, on the other hand, involve higher costs due to long-distance connectivity and the need for more complex routing and management.

5. **Connectivity**: LANs use local connections like Ethernet or Wi-Fi for device connectivity, while WANs use public and private telecommunication links such as leased lines, fiber-optic cables, and satellite links to interconnect geographically dispersed locations.

In summary, LANs are designed for local communication within a limited area, offering high data transfer rates and private ownership. WANs, on the other hand, connect multiple LANs across large distances, have lower data transfer rates, and involve multiple organizations and telecommunication providers.

4 (c). What is a URL in the context of Internet? Explain with the help of an example. Also explain the role of DNS with the help of an example.

Ans: URL stands for Uniform Resource Locator. In the context of the internet, a URL is a reference or address used to locate resources, such as web pages, files, images, videos, or any other content accessible on the World Wide Web. It provides a

standardized way to specify the location of resources and allows users to access them through web browsers.

Example of a URL: Let's consider the URL of the google.com homepage - https://google.com/

In this example:
- "https://" indicates the protocol or scheme being used, in this case, Hypertext Transfer Protocol Secure (HTTPS), which ensures secure data transfer between the user's browser and the website's server.
- "google.com" is the domain name, representing the address of the website on the internet.
- The rest of the URL ("/") represents the path on the web server where the specific resource (homepage in this case) is located.

Role of DNS (Domain Name System) with an example:
The DNS is a crucial system that translates human-readable domain names (like google.com) into their corresponding IP addresses (like 104.22.46.249). It acts as a distributed database, allowing users to access websites using domain names instead of numeric IP addresses.

Example: When a user enters "google.com" in the web browser, the browser sends a request to a DNS resolver (often provided by the ISP). The DNS resolver queries the DNS servers to find the IP address associated with "google.com." Once the IP address (e.g., 104.22.46.249) is obtained, the browser can establish a connection with the web server hosting the google website to retrieve the requested content.

In summary, a URL provides a way to specify the location of resources on the internet, while DNS plays a crucial role in translating human-readable domain names into their corresponding IP addresses, enabling seamless and user-friendly web browsing.

4 (d). Explain the characteristics of the following :
(i) WIKI
(ii) Social Networking

Ans (i): WIKI

Wikis are collaborative websites or platforms that allow users to create, edit, and link content collaboratively. The term "wiki" comes from the Hawaiian word for "quick." The most well-known example of a wiki is Wikipedia, an online encyclopedia built collaboratively by users around the world. Here are the key characteristics of wikis:

1. **Collaborative Editing**: Wikis enable multiple users to edit and contribute to the content. Users can create new pages, edit existing ones, and link related information, fostering a collaborative and community-driven approach to content creation.

2. **Version History**: Wikis maintain a version history of each page, allowing users to view and revert to previous versions of the content. This feature facilitates easy tracking of changes and ensures content integrity.

3. **Easy Markup Language**: Most wikis use a simple markup language (e.g., MediaWiki's wikitext) that allows users to format and structure content easily without requiring extensive knowledge of HTML or coding.

4. **Hyperlinked Structure**: Wikis are organized with a hyperlinked structure, where pages are interconnected through internal links. This makes it convenient for users to navigate between related topics and create a web of interconnected content.

5. **Open Access and Public View**: Most wikis are publicly accessible, allowing anyone to view the content. However, editing permissions may vary, with some wikis being fully open

for editing by anyone and others requiring registration or approval for editing.

6. **Community Moderation**: Wikis often rely on a community of users to moderate and maintain the quality of content. Users can revert vandalism or inappropriate edits and participate in discussions about content improvements.

7. **User-Friendly Interface**: Wikis usually have a user-friendly interface, making it easy for users to contribute and collaborate. Many wikis also offer a "sandbox" or testing area where users can practice editing before making changes to the main content.

Wikis have become powerful tools for collaborative knowledge sharing, allowing individuals with diverse expertise and perspectives to contribute to and access information on a wide range of topics.

Ans (ii). Social Networking

Social networking refers to online platforms or websites that enable individuals to connect, interact, and share information with others in a virtual community. The characteristics of social networking platforms include:

1. **User Profiles**: Social networking platforms allow users to create personal profiles with details such as name, photo, location, interests, and other information, which helps users identify and connect with each other.

2. **Friends or Connections**: Users can establish connections with other users on the platform, usually by sending or accepting friend requests or connection invitations. These connections form the user's social network.

3. **Communication and Interaction**: Social networking platforms provide various means of communication, including messaging, comments, likes, shares, and reactions, allowing

users to interact with each other and engage with the content shared.

4. **Content Sharing**: Users can share various types of content, such as text posts, photos, videos, links, and articles, with their connections. This content can be viewed, commented on, and shared further within the network.

5. **Privacy Settings**: Social networking platforms offer privacy settings that allow users to control who can view their profile, posts, and personal information. Users can customize their privacy preferences to maintain their desired level of online visibility.

6. **Groups and Communities**: Many social networking platforms have features for creating or joining groups and communities based on common interests, hobbies, or affiliations. These groups facilitate discussions and interactions among like-minded individuals.

7. **Real-Time Updates**: Social networking platforms provide real-time updates, showing users the latest posts and activities of their connections, keeping them informed about ongoing discussions and events.

8. **News Feed**: A news feed displays a personalized stream of content from a user's connections, providing a centralized location to see and engage with updates from friends and other network members.

9. **Mobile Integration**: Social networking platforms are often accessible through mobile apps, enabling users to stay connected and engaged on-the-go.

Social networking platforms have become significant online communities that foster communication, collaboration, and socialization on a global scale. They play a vital role in

connecting people, sharing information, promoting events, and facilitating social interactions in the digital age.