**IT Quiz**

**Al Noman Robin**

**Programming Fundamentals :**

●**Basic Concepts**: Syntax, variables, data types, operators, input/output.

**● Control Structures:** If-else statements, loops (for, while), switch-case.

**● Functions:** Definitions, return types, parameters, recursion.

**● Error Handling:** Try-catch blocks, debugging basics.

**● Pointers:** Basics and usage.

**● Object Oriented Programming (OOP):** Basic concepts and four pillars of OOP. For this topic create 200 MCQ

**Basic Concepts**

**Syntax**

1. What is the correct syntax for a single-line comment in C++?  
   a) //  
   b) /\*  
   c) #  
   d) %  
   **Answer:** a
2. Which symbol is used to end a statement in most programming languages like C++ and Java?  
   a) :  
   b) .  
   c) ;  
   d) ,  
   **Answer:** c

**Variables**

1. Which of the following is a correct variable declaration in Python?  
   a) int x = 5;  
   b) x = 5  
   c) declare x = 5  
   d) var x := 5  
   **Answer:** b
2. What is the purpose of a variable?  
   a) Store data  
   b) Execute code  
   c) Import libraries  
   d) None of the above  
   **Answer:** a

**Data Types**

1. Which of these is a primitive data type in Java?  
   a) String  
   b) float  
   c) List  
   d) Dictionary  
   **Answer:** b
2. What is the size of a char in C++?  
   a) 1 byte  
   b) 2 bytes  
   c) 4 bytes  
   d) 8 bytes  
   **Answer:** a

**Operators**

1. What type of operator is + in C++?  
   a) Relational  
   b) Logical  
   c) Arithmetic  
   d) Bitwise  
   **Answer:** c
2. Which operator is used to compare two values in Python?  
   a) =  
   b) ==  
   c) !=  
   d) <=>  
   **Answer:** b

**Input/Output**

1. What is the standard input function in Python?  
   a) input()  
   b) get()  
   c) cin  
   d) read()  
   **Answer:** a
2. In C++, which library must be included to use cout?  
   a) <iostream>  
   b) <stdio.h>  
   c) <string>  
   d) <fstream>  
   **Answer:** a

**Control Structures**

**If-Else Statements**

1. What is the output of this Python code?

python

Copy code

x = 5

if x > 3:

print("Hello")

else:

print("World")

* 1. Hello  
     b) World  
     c) Error  
     d) None  
     **Answer:** a

1. Which keyword is used in Python for an alternate condition in an if statement?  
   a) elseif  
   b) else if  
   c) elif  
   d) elseif:  
   **Answer:** c

**Loops**

1. How many times will the following loop execute?

c++

Copy code

for (int i = 0; i < 5; i++) {

cout << i;

}

* 1. 4  
     b) 5  
     c) 6  
     d) Infinite  
     **Answer:** b

1. Which statement is used to exit a loop prematurely in Python?  
   a) exit  
   b) break  
   c) stop  
   d) end  
   **Answer:** b

**Switch-Case**

1. Which language supports a switch statement?  
   a) Python  
   b) C++  
   c) JavaScript  
   d) Both b and c  
   **Answer:** d
2. What is mandatory to end a case in a switch in C++?  
   a) end  
   b) break  
   c) exit  
   d) None of the above  
   **Answer:** b

**Functions**

**Definitions**

1. What is the correct way to define a function in Python?  
   a) function foo()  
   b) def foo():  
   c) func foo()  
   d) foo()  
   **Answer:** b
2. A function in C++ that does not return a value is declared as:  
   a) empty  
   b) void  
   c) null  
   d) int  
   **Answer:** b

**Recursion**

1. A recursive function must have:  
   a) A loop  
   b) A base condition  
   c) A global variable  
   d) None of the above  
   **Answer:** b
2. What is recursion in programming?  
   a) Iterating over a loop  
   b) Calling the same function from within itself  
   c) Writing complex functions  
   d) All of the above  
   **Answer:** b

**Error Handling**

**Try-Catch Blocks**

1. What is the purpose of a try-catch block?  
   a) To debug the code  
   b) To handle exceptions  
   c) To declare variables  
   d) None of the above  
   **Answer:** b
2. Which language does not support try-catch natively?  
   a) Python  
   b) C++  
   c) C  
   d) Java  
   **Answer:** c

**Debugging Basics**

1. Which of the following is NOT a debugging tool?  
   a) GDB  
   b) Visual Studio Debugger  
   c) print statements  
   d) None of the above  
   **Answer:** d

**Pointers**

1. What does a pointer store?  
   a) A variable  
   b) An address of a variable  
   c) A value directly  
   d) A function definition  
   **Answer:** b
2. Which operator is used to access the value at the address stored in a pointer in C++?  
   a) &  
   b) \*  
   c) ->  
   d) .  
   **Answer:** b

**Object-Oriented Programming (OOP)**

**Basic Concepts**

1. Which of the following is NOT a feature of OOP?  
   a) Polymorphism  
   b) Inheritance  
   c) Encapsulation  
   d) Compilation  
   **Answer:** d
2. OOP is based on:  
   a) Functions  
   b) Objects and classes  
   c) Data structures  
   d) None of the above  
   **Answer:** b

**Four Pillars**

1. Which is not one of the four pillars of OOP?  
   a) Abstraction  
   b) Encapsulation  
   c) Inheritance  
   d) Compilation  
   **Answer:** d
2. What does polymorphism allow in OOP?  
   a) Multiple inheritance  
   b) Overriding methods  
   c) Using one function in multiple forms  
   d) None of the above  
   **Answer:** c

**Basic Concepts**

**Syntax**

1. Which of the following is used to indicate the start of a block in Python?  
   a) {  
   b) :  
   c) ;  
   d) (  
   **Answer:** b
2. In C++, what happens if a semicolon is missing at the end of a statement?  
   a) No error  
   b) Syntax error  
   c) Logic error  
   d) Runtime error  
   **Answer:** b

**Variables**

1. In JavaScript, which keyword is used to declare a variable?  
   a) var  
   b) let  
   c) const  
   d) All of the above  
   **Answer:** d
2. What is the value of an uninitialized variable in C++?  
   a) 0  
   b) Null  
   c) Garbage value  
   d) Undefined  
   **Answer:** c

**Data Types**

1. Which data type in Python is used to store decimal numbers?  
   a) int  
   b) float  
   c) double  
   d) char  
   **Answer:** b
2. What is the size of an int in C++ (typically)?  
   a) 2 bytes  
   b) 4 bytes  
   c) 8 bytes  
   d) System-dependent  
   **Answer:** d

**Operators**

1. Which operator is used to find the remainder of a division in Python?  
   a) /  
   b) //  
   c) %  
   d) \*\*  
   **Answer:** c
2. What is the result of the expression 5 + 2 \* 3 in C++?  
   a) 21  
   b) 15  
   c) 11  
   d) 17  
   **Answer:** c

**Input/Output**

1. In Java, what is used to read user input?  
   a) BufferedReader  
   b) Scanner  
   c) cin  
   d) System.input()  
   **Answer:** b
2. What is the correct way to print a string in Python?  
   a) echo "Hello"  
   b) printf("Hello")  
   c) System.out.println("Hello")  
   d) print("Hello")  
   **Answer:** d

**Control Structures**

**If-Else Statements**

1. Which of the following is NOT a valid relational operator in C++?  
   a) >=  
   b) <=  
   c) =>  
   d) <  
   **Answer:** c
2. In Python, how is an else block written?  
   a) else:  
   b) else()  
   c) else  
   d) elsif:  
   **Answer:** a

**Loops**

1. What will be the output of this loop in C++?
   1. c++
   2. Copy code
   3. int x = 1;
   4. while (x < 3) {
      1. cout << x;
      2. x++;
   5. }
   6. 12  
      b) 123  
      c) Error  
      d) Infinite loop  
      **Answer:** a
2. Which loop in Python is guaranteed to run at least once?  
   a) for  
   b) while  
   c) do-while  
   d) None of the above  
   **Answer:** c

**Switch-Case**

1. What will happen if a break statement is omitted in a switch case in C++?  
   a) Compiler error  
   b) All cases execute sequentially  
   c) Program terminates  
   d) None of the above  
   **Answer:** b
2. What type of value can a switch expression evaluate in Java?  
   a) Integer  
   b) String  
   c) Boolean  
   d) Both a and b  
   **Answer:** d

**Functions**

**Definitions**

1. What is the output of the following Python code?
   1. python
   2. Copy code
   3. def greet():
      1. print("Hi")
   4. greet()
   5. Nothing  
      b) Hi  
      c) Error  
      d) None  
      **Answer:** b
2. Which of the following is the correct way to pass a value to a function in C++?  
   a) foo[]  
   b) foo()  
   c) foo(int x)  
   d) foo[]()  
   **Answer:** c

**Return Types**

1. A function in C++ returns a value using the keyword:  
   a) return  
   b) give  
   c) result  
   d) output  
   **Answer:** a
2. What happens if a Python function does not explicitly return a value?  
   a) It returns 0  
   b) It returns None  
   c) It returns undefined  
   d) It causes an error  
   **Answer:** b

**Error Handling**

**Try-Catch Blocks**

1. What is the output of the following Python code?
   1. python
   2. Copy code
   3. try:
      1. x = 1 / 0
   4. except ZeroDivisionError:
      1. print("Error")
   5. Error  
      b) None  
      c) Runtime exception  
      d) Compiler error  
      **Answer:** a
2. In Java, where should a finally block appear in a try-catch structure?  
   a) Before try  
   b) After try-catch  
   c) Inside catch  
   d) None of the above  
   **Answer:** b

**Pointers**

1. In C++, which operator is used to obtain the address of a variable?  
   a) \*  
   b) &  
   c) @  
   d) %  
   **Answer:** b
2. A pointer in C++ is declared using which symbol?  
   a) @  
   b) %  
   c) \*  
   d) &  
   **Answer:** c

**Object-Oriented Programming (OOP)**

**Basic Concepts**

1. In OOP, what does encapsulation refer to?  
   a) Combining data and functions  
   b) Inheritance hierarchy  
   c) Multiple functions in one class  
   d) None of the above  
   **Answer:** a
2. Which programming language introduced the concept of OOP?  
   a) C++  
   b) Java  
   c) Simula  
   d) Python  
   **Answer:** c

**Four Pillars**

1. Inheritance allows:  
   a) Code duplication  
   b) Extending existing functionality  
   c) Breaking encapsulation  
   d) None of the above  
   **Answer:** b
2. Polymorphism in OOP can be achieved by:  
   a) Overloading functions  
   b) Overriding functions  
   c) Both a and b  
   d) None of the above  
   **Answer:** c

**Basic Concepts**

**Syntax**

1. What is the correct way to write a block comment in C++?  
   a) // Comment  
   b) /\* Comment \*/  
   c) # Comment  
   d) <!-- Comment -->  
   **Answer:** b
2. In Python, indentation is used for:  
   a) Declaring variables  
   b) Structuring blocks of code  
   c) Commenting  
   d) All of the above  
   **Answer:** b

**Variables**

1. Which of the following is not a valid variable name in Python?  
   a) \_myVar  
   b) 2ndVar  
   c) my\_var  
   d) var2  
   **Answer:** b
2. In Java, which keyword is used to declare a constant?  
   a) const  
   b) final  
   c) static  
   d) constant  
   **Answer:** b

**Data Types**

1. In JavaScript, which data type is used to represent a true/false value?  
   a) int  
   b) boolean  
   c) float  
   d) string  
   **Answer:** b
2. What is the default value of a String variable in Java?  
   a) "" (empty string)  
   b) null  
   c) "undefined"  
   d) 0  
   **Answer:** b

**Operators**

1. In Python, what is the result of the following expression: 10 // 3?  
   a) 3.33  
   b) 3  
   c) 4  
   d) Error  
   **Answer:** b
2. Which operator has the highest precedence in C++?  
   a) +  
   b) \*  
   c) ()  
   d) =  
   **Answer:** c

**Input/Output**

1. In C, which function is used to print text to the console?  
   a) print()  
   b) printf()  
   c) cout  
   d) System.out.println()  
   **Answer:** b
2. In Python, how do you take integer input from a user?  
   a) int(input())  
   b) scanf("%d")  
   c) input()  
   d) cin >>  
   **Answer:** a

**Control Structures**

**If-Else Statements**

1. Which of the following is a valid if statement in Java?  
   a) if x > 10:  
   b) if (x > 10)  
   c) if {x > 10}  
   d) if (x > 10):  
   **Answer:** b
2. What is the correct syntax for an if-else statement in C++?  
   a) if (condition) { ... } else { ... }  
   b) if condition: { ... } else: { ... }  
   c) if {condition} ( ... ) else ( ... )  
   d) None of the above  
   **Answer:** a

**Loops**

1. Which loop is best suited for iterating through an array in C++?  
   a) for  
   b) while  
   c) do-while  
   d) All of the above  
   **Answer:** a
2. What will be the output of the following Python code?
   1. python
   2. Copy code
   3. for i in range(3):
      1. print(i)
   4. 1 2 3  
      b) 0 1 2  
      c) 0 1 2 3  
      d) Error  
      **Answer:** b

**Switch-Case**

1. In JavaScript, which keyword is used to handle default behavior in a switch statement?  
   a) else  
   b) default  
   c) case  
   d) otherwise  
   **Answer:** b
2. In C++, what happens if a default case is not provided in a switch statement?  
   a) Compiler error  
   b) No action is taken if no case matches  
   c) Program crashes  
   d) None of the above  
   **Answer:** b

**Functions**

**Recursion**

1. What is an example of a recursive function?  
   a) A function that calls itself  
   b) A function that contains a loop  
   c) A function that returns a constant value  
   d) A function with no arguments  
   **Answer:** a
2. Which of the following problems can be solved using recursion?  
   a) Factorial calculation  
   b) Fibonacci series  
   c) Tree traversal  
   d) All of the above  
   **Answer:** d

**Error Handling**

**Try-Catch Blocks**

1. What is the output of this Python code?
   1. python
   2. Copy code
   3. try:
      1. print(1/0)
   4. except ZeroDivisionError:
      1. print("Cannot divide by zero")
   5. Runtime Error  
      b) Cannot divide by zero  
      c) None  
      d) Compiler Error  
      **Answer:** b
2. In C++, exceptions are handled using which keyword?  
   a) try-catch  
   b) if-else  
   c) throw  
   d) Both a and c  
   **Answer:** d

**Pointers**

1. What is the output of the following C++ code?
   1. c++
   2. Copy code
   3. int x = 10;
   4. int\* p = &x;
   5. cout << \*p;
2. Memory address of x  
   b) 10  
   c) Error  
   d) \*p  
   **Answer:** b
3. In C++, what does the nullptr keyword represent?  
   a) A null character  
   b) A null pointer  
   c) A zero value  
   d) A constant pointer  
   **Answer:** b

**Object-Oriented Programming (OOP)**

**Basic Concepts**

1. A class in OOP is:  
   a) A blueprint for objects  
   b) A specific object  
   c) A data type  
   d) None of the above  
   **Answer:** a
2. In OOP, what does a constructor do?  
   a) Initializes an object  
   b) Deletes an object  
   c) Copies an object  
   d) None of the above  
   **Answer:** a

**Four Pillars**

1. Which of the following is an example of inheritance in Java?  
   a) class B extends A  
   b) class B inherits A  
   c) class B(A)  
   d) inherit B from A  
   **Answer:** a
2. What is abstraction in OOP?  
   a) Hiding the internal details and showing only functionality  
   b) Using the same method name for different purposes  
   c) Sharing properties between classes  
   d) Writing code without a class  
   **Answer:** a
   * 1. **Basic Concepts**

**Syntax**

1. What symbol is used to end a statement in Java?  
   a) :  
   b) ;  
   c) .  
   d) !  
   **Answer:** b
2. Which of the following is the correct way to start a Python function?  
   a) func myFunction()  
   b) def myFunction():  
   c) start myFunction:  
   d) define myFunction  
   **Answer:** b

**Variables**

1. In C++, what is the scope of a variable declared within a block?  
   a) Global  
   b) Function-level  
   c) Block-level  
   d) Static  
   **Answer:** c
2. Which of the following is not a primitive data type in Java?  
   a) int  
   b) float  
   c) String  
   d) char  
   **Answer:** c

**Data Types**

1. What is the range of the int data type in Java (32-bit)?  
   a) -32768 to 32767  
   b) -2147483648 to 2147483647  
   c) -9223372036854775808 to 9223372036854775807  
   d) None of the above  
   **Answer:** b
2. In Python, which of the following is **not** a valid data type?  
   a) str  
   b) tuple  
   c) list  
   d) double  
   **Answer:** d

**Operators**

1. What does the \*\* operator do in Python?  
   a) Floor division  
   b) Exponentiation  
   c) Modulo  
   d) None of the above  
   **Answer:** b
2. In Java, which operator is used to check equality?  
   a) =  
   b) ==  
   c) ===  
   d) !=  
   **Answer:** b

**Input/Output**

1. In Java, how do you output text to the console?  
   a) System.out.print()  
   b) Console.write()  
   c) output()  
   d) print()  
   **Answer:** a
2. What is the correct way to read a line of input in C++?  
   a) cin.getline()  
   b) cin >>  
   c) getline(cin, variable)  
   d) cin.read()  
   **Answer:** c

**Control Structures**

**If-Else Statements**

1. What will the following JavaScript code output?
   1. javascript
   2. Copy code
   3. if (false) {
      1. console.log("Yes");
   4. } else {
      1. console.log("No");
   5. }
   6. Yes  
      b) No  
      c) Error  
      d) Nothing  
      **Answer:** b
2. In Python, how do you check multiple conditions in an if statement?  
   a) Use and or or  
   b) Use && or ||  
   c) Use & or |  
   d) Use elseif  
   **Answer:** a

**Loops**

1. What is the output of the following Java code?
   1. java
   2. Copy code
   3. for (int i = 0; i < 5; i++) {
      1. System.out.print(i);
   4. }
2. 01234  
   b) 12345  
   c) 012345  
   d) Error  
   **Answer:** a
3. In C++, what is the purpose of the continue statement in a loop?  
   a) Terminates the loop  
   b) Skips the rest of the loop iteration  
   c) Restarts the loop from the beginning  
   d) None of the above  
   **Answer:** b

**Switch-Case**

1. Which of the following is true about switch statements?  
   a) They support only int in C++  
   b) A break is mandatory after each case  
   c) Default case is optional  
   d) They cannot be nested  
   **Answer:** c
2. What is the output of this Python match statement?
   1. python
   2. Copy code
   3. value = 3
   4. match value:
      1. case 1:
      2. print("One")
      3. case 2:
      4. print("Two")
      5. case \_:
      6. print("Default")
3. One  
   b) Two  
   c) Default  
   d) Error  
   **Answer:** c

**3. Functions**

**Definitions**

1. What does the void keyword in C++ indicate?  
   a) Function returns nothing  
   b) Function has no parameters  
   c) Function is private  
   d) None of the above  
   **Answer:** a
2. In Python, how do you define a function with default parameters?  
   a) def my\_func(a=1, b=2):  
   b) def my\_func(a: 1, b: 2):  
   c) my\_func(a=1, b=2)  
   d) None of the above  
   **Answer:** a

**Recursion**

1. Which of the following is NOT a feature of recursive functions?  
   a) Function calls itself  
   b) Requires a base condition  
   c) Uses loops internally  
   d) May cause stack overflow if not implemented correctly  
   **Answer:** c
2. What is a common problem when using recursion excessively?  
   a) Memory leak  
   b) Infinite loops  
   c) Stack overflow  
   d) Segmentation fault  
   **Answer:** c

**4. Error Handling**

1. What is the output of this JavaScript code?  
   javascript try { throw "An error occurred"; } catch (e) { console.log(e); }  
   a) undefined  
   b) An error occurred  
   c) Error  
   d) Syntax Error  
   **Answer:** b
2. In Python, which keyword is used to handle exceptions?  
   a) try  
   b) except  
   c) finally  
   d) All of the above  
   **Answer:** d

**5. Pointers**

1. Which of the following is a valid way to declare a pointer in C++?  
   a) int\* ptr;  
   b) int ptr\*;  
   c) \*int ptr;  
   d) pointer<int> ptr;  
   **Answer:** a
2. What does \*ptr in C++ represent?  
   a) The address stored in the pointer  
   b) The value at the address the pointer is pointing to  
   c) The type of the pointer  
   d) The size of the pointer  
   **Answer:** b

**Object-Oriented Programming (OOP)**

**Basic Concepts**

1. What is the purpose of encapsulation?  
   a) To hide implementation details  
   b) To inherit properties from another class  
   c) To define multiple functions  
   d) To initialize data members  
   **Answer:** a
2. In OOP, a method with the same name as its class is called:  
   a) Constructor  
   b) Destructor  
   c) Operator  
   d) Encapsulation  
   **Answer:** a

**Four Pillars**

1. Which of the following represents polymorphism in OOP?  
   a) Function overloading  
   b) Function overriding  
   c) Both a and b  
   d) None of the above  
   **Answer:** c
2. Which pillar of OOP allows one class to use properties of another class?  
   a) Polymorphism  
   b) Inheritance  
   c) Encapsulation  
   d) Abstraction  
   **Answer:** b
   * 1. **Basic Concepts**
3. What will happen if you try to modify a const variable in C++?  
   a) The program compiles and runs normally  
   b) The program will crash at runtime  
   c) Compilation error  
   d) Undefined behavior  
   **Answer:** c
4. What is the result of the following Python code?  
   python x = 0.1 + 0.2 print(x == 0.3)  
   a) True  
   b) False  
   c) None  
   d) Error  
   **Answer:** b

**Data Types**

1. Which of the following is true about the float type in C++?  
   a) It is guaranteed to be 4 bytes  
   b) It can store decimal and integer values  
   c) It has more precision than double  
   d) It cannot be used in arithmetic operations  
   **Answer:** b
2. What is the primary difference between mutable and immutable objects in Python?  
   a) Immutable objects cannot be changed, while mutable ones can  
   b) Mutable objects are faster  
   c) Immutable objects are types like list, dict  
   d) Mutable objects cannot be passed by reference  
   **Answer:** a

**Operators**

1. In C++, what is the output of the following code?  
   c++ int x = 10, y = 5; cout << (x > y ? x : y) \* 2;  
   a) 10  
   b) 20  
   c) 5  
   d) Compilation error  
   **Answer:** b
2. In JavaScript, which of the following evaluates to true?  
   a) null == undefined  
   b) 0 == "0"  
   c) [] == false  
   d) All of the above  
   **Answer:** d

**2. Control Structures**

1. What is the output of the following Python code?  
   python x = 10 if x > 5: x += 1 else: x -= 1 print(x)  
   a) 9  
   b) 10  
   c) 11  
   d) None of the above  
   **Answer:** c
2. Which of the following loop constructs is most efficient for traversing a LinkedList in Java?  
   a) for loop  
   b) while loop  
   c) for-each loop  
   d) None of the above  
   **Answer:** c

**3. Functions**

1. What is the primary advantage of recursion over iteration?  
   a) Lower memory usage  
   b) Simpler code for problems like tree traversal  
   c) Faster execution  
   d) None of the above  
   **Answer:** b
2. In C++, what will be the output of this function if called with fibonacci(4)?  
   c++ int fibonacci(int n) { if (n <= 1) return n; return fibonacci(n - 1) + fibonacci(n - 2); }  
   a) 3  
   b) 5  
   c) 4  
   d) Compilation error  
   **Answer:** a

**4. Error Handling**

1. In Java, what happens if an exception is thrown but not caught in the code?  
   a) The program terminates immediately  
   b) The JVM handles the exception and continues execution  
   c) The exception is ignored  
   d) Compilation error  
   **Answer:** a
2. In Python, what is the purpose of the else block in a try-except statement?  
   a) It runs if no exceptions are raised in the try block  
   b) It always runs after the try block  
   c) It only runs if an exception is raised  
   d) None of the above  
   **Answer:** a

**5. Pointers**

1. In C++, what will happen if you dereference a null pointer?  
   a) The program will terminate with a segmentation fault  
   b) Undefined behavior  
   c) It will print NULL  
   d) Compilation error  
   **Answer:** b
2. Which of the following statements about pointers in C++ is correct?  
   a) A pointer can be assigned the value of a regular variable  
   b) A pointer must always point to a valid memory location  
   c) A pointer can be incremented or decremented  
   d) None of the above  
   **Answer:** c

**6. Object-Oriented Programming (OOP)**

1. What is the significance of a **pure virtual function** in C++?  
   a) It is a function without implementation, forcing derived classes to implement it  
   b) It is a function that cannot be overridden  
   c) It is a private function  
   d) It is a function declared using the static keyword  
   **Answer:** a
2. Which of the following is **not** an advantage of inheritance?  
   a) Code reusability  
   b) Strong encapsulation of data  
   c) Creation of hierarchical relationships  
   d) Reduced code maintenance  
   **Answer:** b
3. What does the final keyword in Java do when applied to a class?  
   a) Prevents the class from being inherited  
   b) Makes the class immutable  
   c) Ensures the class cannot be instantiated  
   d) None of the above  
   **Answer:** a

## ****Basic Concepts****

### ****Variables and Scope****

1. What is the lifetime of a static variable in C++?  
   a) The duration of the program execution  
   b) The duration of the function where it is declared  
   c) The duration of a single loop iteration  
   d) The duration of its block scope  
   **Answer:** a
2. What will happen in Python if two variables a and b reference the same mutable object and you modify a?  
   a) Only a is modified  
   b) Both a and b are modified  
   c) a and b reference separate objects  
   d) None of the above  
   **Answer:** b

### ****Operators****

1. In Java, what does the >>> operator do?  
   a) Arithmetic left shift  
   b) Arithmetic right shift  
   c) Logical right shift  
   d) Bitwise NOT  
   **Answer:** c
2. What is the result of the following Python expression?  
   python x = True + True \* False print(x)   
   a) 1  
   b) 2  
   c) 0  
   d) Error  
   **Answer:** a

## ****2. Control Structures****

1. Which of the following is **not** a valid use of the break statement in Python?  
   a) Breaking out of a for loop  
   b) Breaking out of a while loop  
   c) Breaking out of a try block  
   d) None of the above  
   **Answer:** c
2. What is the output of the following C++ code?  
   c++ for (int i = 0; i < 3; i++) { for (int j = 0; j < 2; j++) { if (i == 1) break; cout << i << j << " "; } }   
   a) 00 01 20 21  
   b) 00 01 10 20 21  
   c) 00 01 10 11 20 21  
   d) 00 01 20 21  
   **Answer:** d

## ****3. Functions****

### ****Recursion****

1. Consider this recursive Python function:  
   python def mystery(n): if n == 0: return 0 return n + mystery(n // 2) print(mystery(10))   
   What is the output?  
   a) 19  
   b) 15  
   c) 10  
   d) 21  
   **Answer:** b

### ****Parameters****

1. What is the difference between pass-by-value and pass-by-reference?  
   a) Pass-by-value passes the reference, while pass-by-reference passes the value  
   b) Pass-by-reference allows modifying the original object, while pass-by-value does not  
   c) Pass-by-value is only supported in object-oriented programming languages  
   d) None of the above  
   **Answer:** b

## ****4. Error Handling****

1. In Java, how do you handle multiple exceptions in a single catch block?  
   a) Use a comma-separated list of exception types  
   b) Use a pipe (|) operator to combine exception types  
   c) Nest catch blocks  
   d) Use throw inside the try block  
   **Answer:** b
2. What is the purpose of the finally block in Python?  
   a) It is executed if an exception is raised  
   b) It is always executed, regardless of exceptions  
   c) It is only executed when no exceptions occur  
   d) It is used to re-raise exceptions  
   **Answer:** b

## ****5. Pointers****

1. What will happen if you attempt to delete a pointer twice in C++?  
   a) The pointer will be deleted without issues  
   b) The program may crash (undefined behavior)  
   c) Compilation error  
   d) The second deletion will be ignored  
   **Answer:** b
2. Which of the following correctly describes void\* in C++?  
   a) It is a pointer to a void function  
   b) It can point to any data type  
   c) It is a null pointer  
   d) It is not a valid pointer type  
   **Answer:** b

## ****6. Object-Oriented Programming (OOP)****

### ****Inheritance****

1. In C++, what is the output of the following code?  
   c++ class A { public: A() { cout << "A "; } }; class B : public A { public: B() { cout << "B "; } }; int main() { B obj; return 0; }   
   a) B A  
   b) A B  
   c) AB  
   d) None of the above  
   **Answer:** b

### ****Polymorphism****

1. What is **dynamic dispatch** in OOP?  
   a) Binding method calls to their definitions at compile time  
   b) Resolving method calls based on the object type at runtime  
   c) Allowing multiple methods with the same name  
   d) Overriding methods of the parent class in a derived class  
   **Answer:** b

### ****Abstraction****

1. Which of the following is true about abstract classes in Java?  
   a) Abstract classes cannot have non-abstract methods  
   b) Abstract classes cannot be instantiated directly  
   c) Abstract classes can implement interfaces but cannot extend other classes  
   d) None of the above  
   **Answer:** b

### ****Encapsulation****

1. What is the purpose of the protected access modifier in Java?  
   a) Members are accessible only within the same package  
   b) Members are accessible only in derived classes  
   c) Members are accessible in the same package and subclasses  
   d) Members are accessible everywhere  
   **Answer:** c

## ****Basic Concepts****

1. Which of the following is **not** a valid data type in C++?  
   a) int  
   b) char  
   c) float  
   d) string  
   **Answer:** d (C++ uses *std::string* from the standard library)
2. What does the following Python code output?  
   python print(type(3.0))   
   a) <class 'int'>  
   b) <class 'float'>  
   c) <class 'double'>  
   d) Error  
   **Answer:** b

### ****Variables and Constants****

1. Which of the following keywords is used to define a constant in Java?  
   a) const  
   b) constant  
   c) final  
   d) static  
   **Answer:** c
2. In C++, what is the output of the following code?  
   c++ const int x = 10; int \*ptr = (int\*)&x; \*ptr = 20; cout << x << " " << \*ptr;   
   a) 10 10  
   b) 10 20  
   c) 20 20  
   d) Undefined behavior  
   **Answer:** d (Modifying a *const* variable leads to undefined behavior.)

## ****2. Control Structures****

1. In Java, what will happen if a switch statement does not include a break in one of its cases?  
   a) Only the matching case is executed  
   b) The program exits the switch  
   c) All subsequent cases are executed (fall-through)  
   d) Compilation error  
   **Answer:** c
2. What is the output of the following Python code?  
   python for i in range(5): if i == 3: break print(i, end=' ')   
   a) 0 1 2 3  
   b) 0 1 2  
   c) 1 2 3  
   d) 0 1  
   **Answer:** b

## ****3. Functions****

1. In C++, which of the following is a correct function prototype?  
   a) int sum(a, b);  
   b) int sum(int, int);  
   c) void sum(int a, b);  
   d) sum(int, int) void;  
   **Answer:** b
2. What will happen if you do not return a value in a non-void function in C++?  
   a) The function will return 0 by default  
   b) The compiler throws an error  
   c) The behavior is undefined  
   d) The program runs without output  
   **Answer:** c

### ****Recursion****

1. What is the **base condition** in recursion?  
   a) A condition to terminate the recursion  
   b) A condition where recursion continues indefinitely  
   c) A step that defines the recursive function  
   d) None of the above  
   **Answer:** a
2. What is the result of the following Python function?  
   python def fact(n): if n == 0: return 1 return n \* fact(n-1) print(fact(3))   
   a) 1  
   b) 6  
   c) 3  
   d) Error  
   **Answer:** b

## ****4. Object-Oriented Programming****

1. Which of the following best describes **inheritance** in OOP?  
   a) Combining two classes into one  
   b) Reusing the properties and methods of an existing class in a new class  
   c) Writing multiple functions with the same name  
   d) Restricting access to certain class members  
   **Answer:** b
2. In Java, which of the following is **not true** about the final keyword?  
   a) It can be applied to classes  
   b) It can be applied to methods  
   c) It can be applied to variables  
   d) It can be used to create abstract methods  
   **Answer:** d

## ****5. Pointers****

1. Which of the following statements about pointers in C++ is correct?  
   a) Pointers store the value of a variable  
   b) Pointers store the address of a variable  
   c) Pointers are not part of modern C++  
   d) Pointers cannot be null  
   **Answer:** b
2. What is the output of the following C++ code?  
   c++ int a = 10; int \*p = &a; cout << \*p;   
   a) Address of a  
   b) 10  
   c) Error  
   d) Garbage value  
   **Answer:** b

## ****6. Error Handling****

1. In Python, what happens when an exception is raised inside a try block and there is no matching except block?  
   a) The program exits with an error  
   b) The program ignores the exception  
   c) The finally block (if present) executes, and then the program terminates  
   d) Both a and c  
   **Answer:** d
2. Which of the following is **not** a valid C++ exception type?  
   a) int  
   b) std::exception  
   c) double  
   d) All of the above are valid  
   **Answer:** d
3. **2. Data Structures and Algorithms**

● Core Concepts: Arrays, strings, linked lists.

● Advanced Structures: Stacks, queues, heaps, trees, and graphs.

● Applications: Searching (linear, binary), sorting (bubble, insertion, selection, merge, quicksort).

● Complexity Analysis: Time and space complexity basics.

**Core Concepts**

1. **What is the time complexity of accessing an element in an array?**  
   a) O(1)O(1)O(1)  
   b) O(n)O(n)O(n)  
   c) O(log⁡n)O(\log n)O(logn)  
   d) O(n2)O(n^2)O(n2)  
   **Answer**: a) O(1)O(1)O(1)
2. **Which of the following operations is fastest in a linked list compared to an array?**  
   a) Accessing an element  
   b) Searching for an element  
   c) Insertion at the head  
   d) Accessing the middle element  
   **Answer**: c) Insertion at the head
3. **Advanced Structures**
4. **What type of data structure is a queue?**  
   a) LIFO  
   b) FIFO  
   c) FILO  
   d) Random  
   **Answer**: b) FIFO
5. **Which of the following trees is balanced?**  
   a) Binary Search Tree  
   b) AVL Tree  
   c) Complete Binary Tree  
   d) All of the above  
   **Answer**: d) All of the above

**Applications**

1. **What is the worst-case time complexity of QuickSort?**  
   a) O(nlog⁡n)O(n \log n)O(nlogn)  
   b) O(n2)O(n^2)O(n2)  
   c) O(n)O(n)O(n)  
   d) O(log⁡n)O(\log n)O(logn)  
   **Answer**: b) O(n2)O(n^2)O(n2)
2. **In binary search, the array must be:**  
   a) Unsorted  
   b) Sorted in ascending order  
   c) Sorted in descending order  
   d) Either b or c  
   **Answer**: d) Either b or c
3. **Complexity Analysis**
4. **What is the space complexity of a recursive function with depth ddd?**  
   a) O(d)O(d)O(d)  
   b) O(1)O(1)O(1)  
   c) O(n)O(n)O(n)  
   d) O(d2)O(d^2)O(d2)  
   **Answer**: a) O(d)O(d)O(d)
5. **Which algorithm has the lowest average-case time complexity for sorting?**  
   a) Bubble Sort  
   b) Merge Sort  
   c) QuickSort  
   d) Insertion Sort  
   **Answer**: b) Merge Sort

**Mixed Concepts**

1. **In a binary search tree, the left child of a node contains:**  
   a) Smaller or equal values  
   b) Greater values  
   c) Smaller values  
   d) Equal values  
   **Answer**: c) Smaller values
2. **The adjacency matrix for a graph with nnn vertices has a space complexity of:**  
   a) O(n)O(n)O(n)  
   b) O(n2)O(n^2)O(n2)  
   c) O(nlog⁡n)O(n \log n)O(nlogn)  
   d) O(1)O(1)O(1)  
   **Answer**: b) O(n2)O(n^2)O(n2)

**Core Concepts**

**Arrays**

1. **Which of the following is true about arrays?**  
   a) Arrays are dynamic in size  
   b) Array elements are stored at contiguous memory locations  
   c) Arrays require a linked structure for implementation  
   d) Arrays are always sorted  
   **Answer**: b) Array elements are stored at contiguous memory locations
2. **What is the time complexity of inserting an element at the beginning of an array?**  
   a) O(1)O(1)O(1)  
   b) O(n)O(n)O(n)  
   c) O(log⁡n)O(\log n)O(logn)  
   d) O(n2)O(n^2)O(n2)  
   **Answer**: b) O(n)O(n)O(n)

**Strings**

1. **Which of these functions is used to find the length of a string in C?**  
   a) strlen()  
   b) strsize()  
   c) string\_length()  
   d) size()  
   **Answer**: a) strlen()
2. **What is the time complexity of comparing two strings of length nnn?**  
   a) O(1)O(1)O(1)  
   b) O(n)O(n)O(n)  
   c) O(log⁡n)O(\log n)O(logn)  
   d) O(n2)O(n^2)O(n2)  
   **Answer**: b) O(n)O(n)O(n)

**Linked Lists**

1. **What differentiates a singly linked list from a doubly linked list?**  
   a) Doubly linked lists require less memory  
   b) Singly linked lists can be traversed in both directions  
   c) Doubly linked lists store two pointers per node  
   d) Singly linked lists are faster for all operations  
   **Answer**: c) Doubly linked lists store two pointers per node
2. **What is the best use case of a circular linked list?**  
   a) Undo functionality  
   b) Task scheduling in an operating system  
   c) Storing elements in sorted order  
   d) Implementing a stack  
   **Answer**: b) Task scheduling in an operating system

**Advanced Structures**

**Stacks**

1. **Which of the following applications does NOT use a stack?**  
   a) Parentheses balancing  
   b) Depth First Search  
   c) Breadth First Search  
   d) Function call recursion  
   **Answer**: c) Breadth First Search
2. **Which operation is used to add an element to a stack?**  
   a) Enqueue  
   b) Push  
   c) Insert  
   d) Add  
   **Answer**: b) Push

**Queues**

1. **Which of the following types of queues allows insertion at both ends?**  
   a) Simple Queue  
   b) Circular Queue  
   c) Deque  
   d) Priority Queue  
   **Answer**: c) Deque/Enque
2. **What is the condition for an empty queue in an array-based implementation?**  
   a) rear == size - 1  
   b) rear == front  
   c) rear < front  
   d) rear == -1  
   **Answer**: d) rear == -1

**Heaps**

1. **What is the time complexity of inserting an element in a max-heap?**  
   a) O(1)O(1)O(1)  
   b) O(log⁡n)O(\log n)O(logn)  
   c) O(n)O(n)O(n)  
   d) O(n2)O(n^2)O(n2)  
   **Answer**: b) O(log⁡n)O(\log n)O(logn)
2. **Which of the following properties is correct for a min-heap?**  
   a) Parent nodes are always greater than child nodes  
   b) Parent nodes are always smaller than child nodes  
   c) Leaf nodes are always greater than the root  
   d) It is implemented as a linked list  
   **Answer**: b) Parent nodes are always smaller than child nodes

**Trees**

1. **What is the maximum number of nodes in a binary tree of height hhh?**  
   a) 2h−12^h - 12h−1  
   b) 2h+1−12^{h+1} - 12h+1−1  
   c) h2−1h^2 - 1h2−1  
   d) 2h2^h2h  
   **Answer**: a) 2h−12^h - 12h−1
2. **Which traversal method follows the order: root, left, right?**  
   a) Inorder  
   b) Preorder  
   c) Postorder  
   d) Level order  
   **Answer**: b) Preorder

**Graphs**

1. **Which representation of a graph is more memory-efficient for sparse graphs?**  
   a) Adjacency matrix  
   b) Adjacency list  
   c) Incidence matrix  
   d) Edge list  
   **Answer**: b) Adjacency list
2. **What is the time complexity of Breadth First Search (BFS) in an adjacency list representation?**  
   a) O(V+E)O(V + E)O(V+E)  
   b) O(V2)O(V^2)O(V2)  
   c) O(Elog⁡V)O(E \log V)O(ElogV)  
   d) O(V)O(V)O(V)  
   **Answer**: a) O(V+E)O(V + E)O(V+E)

**Applications**

**Searching**

1. **What is the time complexity of binary search in the worst case?**  
   a) O(1)O(1)O(1)  
   b) O(n)O(n)O(n)  
   c) O(log⁡n)O(\log n)O(logn)  
   d) O(nlog⁡n)O(n \log n)O(nlogn)  
   **Answer**: c) O(log⁡n)O(\log n)O(logn)
2. **Which searching algorithm works efficiently on unsorted data?**  
   a) Linear Search  
   b) Binary Search  
   c) Interpolation Search  
   d) None of the above  
   **Answer**: a) Linear Search

**orting**

1. **What is the space complexity of Merge Sort?**  
   a) O(1)O(1)O(1)  
   b) O(log⁡n)O(\log n)O(logn)  
   c) O(n)O(n)O(n)  
   d) O(nlog⁡n)O(n \log n)O(nlogn)  
   **Answer**: c) O(n)O(n)O(n)
2. **Which sorting algorithm is most suitable for nearly sorted data?**  
   a) QuickSort  
   b) Bubble Sort  
   c) Insertion Sort  
   d) Selection Sort  
   **Answer**: c) Insertion Sort

**Core Concepts**

**Arrays**

1. **Which of the following operations is the most efficient for arrays?**  
   a) Searching an unsorted array  
   b) Deleting an element at the middle  
   c) Appending an element at the end  
   d) Inserting an element at the start  
   **Answer**: c) Appending an element at the end
2. **What is the index of the first element in an array?**  
   a) 111  
   b) 000  
   c) −1-1−1  
   d) Depends on the programming language  
   **Answer**: b) 000

**Strings**

1. **Which of the following string algorithms is used for pattern matching?**  
   a) Knuth-Morris-Pratt (KMP)  
   b) Floyd-Warshall  
   c) Prim's Algorithm  
   d) Dijkstra’s Algorithm  
   **Answer**: a) Knuth-Morris-Pratt (KMP)
2. **Which function is used to concatenate two strings in C?**  
   a) stradd()  
   b) strconcat()  
   c) strcat()  
   d) merge()  
   **Answer**: c) strcat()

**Linked Lists**

1. **What is the best case time complexity of searching for an element in a singly linked list?**  
   a) O(1)O(1)O(1)  
   b) O(n)O(n)O(n)  
   c) O(log⁡n)O(\log n)O(logn)  
   d) O(n2)O(n^2)O(n2)  
   **Answer**: a) O(1)O(1)O(1)
2. **Which of the following operations can be done efficiently in a doubly linked list compared to a singly linked list?**  
   a) Traversing forward  
   b) Traversing backward  
   c) Inserting at the head  
   d) Inserting at the tail  
   **Answer**: b) Traversing backward

**Advanced Structures**

***Stacks***

1. **What is the condition of a stack overflow?**  
   a) Stack is empty  
   b) Stack exceeds its capacity  
   c) Stack contains only one element  
   d) Stack is implemented using a linked list  
   **Answer**: b) Stack exceeds its capacity
2. **Which of the following operations is not possible in a stack?**  
   a) Traversal  
   b) Push  
   c) Pop  
   d) Peek  
   **Answer**: a) Traversal

**Queues**

1. **What is the main advantage of a circular queue over a linear queue?**  
   a) Faster operations  
   b) Fixed size  
   c) Efficient memory usage  
   d) Easier implementation  
   **Answer**: c) Efficient memory usage
2. **In a priority queue implemented using a min-heap, the highest priority element is:**  
   a) At the root  
   b) At the last node  
   c) At the leftmost child  
   d) At the rightmost leaf  
   **Answer**: a) At the root

**Heaps**

1. **Which operation in a heap has the highest time complexity?**  
   a) Insertion  
   b) Deletion  
   c) Building the heap  
   d) Searching for an element  
   **Answer**: d) Searching for an element
2. **What is the structure of a heap?**  
   a) Complete binary tree  
   b) Full binary tree  
   c) Balanced binary tree  
   d) Perfect binary tree  
   **Answer**: a) Complete binary tree

**Trees**

1. **Which traversal technique is used for breadth-first traversal in a tree?**  
   a) Stack  
   b) Queue  
   c) Recursion  
   d) Priority Queue  
   **Answer**: b) Queue
2. **What is the height of a tree with a single node?**  
   a) 0  
   b) 1  
   c) 2  
   d) -1  
   **Answer**: a) 0

**Graphs**

1. **What is the degree of a vertex in a graph?**  
   a) The number of edges connected to the vertex  
   b) The number of vertices connected to the vertex  
   c) The number of loops in the graph  
   d) The number of connected components in the graph  
   **Answer**: a) The number of edges connected to the vertex
2. **Which algorithm is used to detect cycles in a graph?**  
   a) Prim's Algorithm  
   b) Floyd-Warshall Algorithm  
   c) Depth First Search  
   d) Breadth First Search  
   **Answer**: c) Depth First Search

**Applications**

**Searching**

1. **Binary search requires the array to be:**  
   a) Unsorted  
   b) Sorted  
   c) Circular  
   d) Sparse  
   **Answer**: b) Sorted
2. **What is the best-case time complexity of linear search?**  
   a) O(1)O(1)O(1)  
   b) O(n)O(n)O(n)  
   c) O(log⁡n)O(\log n)O(logn)  
   d) O(n2)O(n^2)O(n2)  
   **Answer**: a) O(1)O(1)O(1)

**Sorting**

1. **Which sorting algorithm is the most efficient for large datasets?**  
   a) Bubble Sort  
   b) QuickSort  
   c) Selection Sort  
   d) Insertion Sort  
   **Answer**: b) QuickSort
2. **Which sorting algorithm is not stable?**  
   a) Bubble Sort  
   b) QuickSort  
   c) Merge Sort  
   d) Insertion Sort  
   **Answer**: b) QuickSort

**Complexity Analysis**

1. **What is the time complexity of accessing an element in a hash table (on average)?**  
   a) O(1)O(1)O(1)  
   b) O(log⁡n)O(\log n)O(logn)  
   c) O(n)O(n)O(n)  
   d) O(n2)O(n^2)O(n2)  
   **Answer**: a) O(1)O(1)O(1)
2. **What is the space complexity of a DFS algorithm in a graph with nnn vertices?**  
   a) O(n)O(n)O(n)  
   b) O(log⁡n)O(\log n)O(logn)  
   c) O(n2)O(n^2)O(n2)  
   d) O(1)O(1)O(1)  
   **Answer**: a) O(n)O(n)O(n)
3. **The best-case time complexity of Bubble Sort is:**  
   a) O(n)O(n)O(n)  
   b) O(n2)O(n^2)O(n2)  
   c) O(log⁡n)O(\log n)O(logn)  
   d) O(1)O(1)O(1)  
   **Answer**: a) O(n)O(n)O(n)
4. **What is the auxiliary space used by Merge Sort?**  
   a) O(1)O(1)O(1)  
   b) O(log⁡n)O(\log n)O(logn)  
   c) O(n)O(n)O(n)  
   d) O(n2)O(n^2)O(n2)  
   **Answer**: c) O(n)O(n)O(n)

**Core Concepts**

1. **What is the amortized time complexity of an insertion operation in a dynamic array?**  
   a) O(1)O(1)O(1)  
   b) O(n)O(n)O(n)  
   c) O(log⁡n)O(\log n)O(logn)  
   d) O(n2)O(n^2)O(n2)  
   **Answer**: a) O(1)O(1)O(1)  
   Explanation: Most insertions in a dynamic array take O(1)O(1)O(1), but resizing the array takes O(n)O(n)O(n). Over a series of operations, the amortized complexity is O(1)O(1)O(1).
2. **In a linked list, which condition will identify a loop in the structure using Floyd's cycle detection algorithm?**  
   a) Slow pointer equals the fast pointer  
   b) Slow pointer is null  
   c) Fast pointer is null  
   d) The difference between the pointers is 1  
   **Answer**: a) Slow pointer equals the fast pointer

**Advanced Structures**

**Stacks**

1. **In a stack implemented with two queues, what is the time complexity of the pop operation?**  
   a) O(1)O(1)O(1)  
   b) O(n)O(n)O(n)  
   c) O(log⁡n)O(\log n)O(logn)  
   d) O(n2)O(n^2)O(n2)  
   **Answer**: b) O(n)O(n)O(n)  
   Explanation: To maintain stack order (LIFO) using two FIFO queues, pop involves transferring elements between queues.

**Heaps**

1. **Which of the following operations is not supported efficiently by a binary heap?**  
   a) Insertion  
   b) Deletion of the root  
   c) Finding the maximum in a min-heap  
   d) Extracting the minimum in a min-heap  
   **Answer**: c) Finding the maximum in a min-heap  
   Explanation: Finding the maximum in a min-heap is O(n)O(n)O(n) because the maximum could be at any leaf.
2. **What is the minimum number of nodes in a binary heap of height hhh?**  
   a) 2h−12^h - 12h−1  
   b) 2h−1+12^{h-1} + 12h−1+1  
   c) 2h−12^{h-1}2h−1  
   d) 2h2^h2h  
   **Answer**: c) 2h−12^{h-1}2h−1  
   Explanation: A binary heap has at least 2h−12^{h-1}2h−1 nodes if hhh is the height.

**Trees**

1. **What is the time complexity of finding the Lowest Common Ancestor (LCA) in a Binary Search Tree (BST) with nnn nodes?**  
   a) O(1)O(1)O(1)  
   b) O(log⁡n)O(\log n)O(logn)  
   c) O(n)O(n)O(n)  
   d) O(n2)O(n^2)O(n2)  
   **Answer**: b) O(log⁡n)O(\log n)O(logn)  
   Explanation: Using BST properties, the LCA can be found in a depth-first traversal, which is O(log⁡n)O(\log n)O(logn) for balanced trees.
2. **In an AVL tree, what is the time complexity for inserting a node?**  
   a) O(1)O(1)O(1)  
   b) O(n)O(n)O(n)  
   c) O(log⁡n)O(\log n)O(logn)  
   d) O(n2)O(n^2)O(n2)  
   **Answer**: c) O(log⁡n)O(\log n)O(logn)  
   Explanation: AVL trees are balanced, ensuring logarithmic height. Rotations during insertion take O(log⁡n)O(\log n)O(logn).

**Graphs**

1. **Which of the following algorithms can be used to find all strongly connected components in a directed graph?**  
   a) Dijkstra's Algorithm  
   b) Kruskal’s Algorithm  
   c) Tarjan's Algorithm  
   d) Prim's Algorithm  
   **Answer**: c) Tarjan's Algorithm
2. **What is the time complexity of Dijkstra’s algorithm with a Fibonacci heap for a graph with VVV vertices and EEE edges?**  
   a) O(V2)O(V^2)O(V2)  
   b) O(E+Vlog⁡V)O(E + V \log V)O(E+VlogV)  
   c) O(Elog⁡V)O(E \log V)O(ElogV)  
   d) O(E2)O(E^2)O(E2)  
   **Answer**: b) O(E+Vlog⁡V)O(E + V \log V)O(E+VlogV)  
   Explanation: The Fibonacci heap optimizes the priority queue operations, reducing the complexity.
3. **What is the maximum number of edges in a directed acyclic graph (DAG) with nnn vertices?**  
   a) n(n−1)n(n-1)n(n−1)  
   b) (n2)/2(n^2)/2(n2)/2  
   c) n2−nn^2 - nn2−n  
   d) n(n−1)/2n(n-1)/2n(n−1)/2  
   **Answer**: c) n2−nn^2 - nn2−n  
   Explanation: In a DAG, each vertex can have directed edges to n−1n-1n−1 other vertices.

**Applications**

1. **In QuickSort, which pivot selection strategy ensures O(nlog⁡n)O(n \log n)O(nlogn) performance in the worst case?**  
   a) First element as pivot  
   b) Last element as pivot  
   c) Median of the array as pivot  
   d) Random element as pivot  
   **Answer**: c) Median of the array as pivot  
   Explanation: The median guarantees balanced partitions, ensuring O(nlog⁡n)O(n \log n)O(nlogn).
2. **Which of the following searching algorithms works in O(log⁡log⁡n)O(\log \log n)O(loglogn) in some cases?**  
   a) Interpolation Search  
   b) Binary Search  
   c) Linear Search  
   d) Fibonacci Search  
   **Answer**: a) Interpolation Search  
   Explanation: For uniformly distributed data, Interpolation Search performs better than Binary Search.

### ****Complexity Analysis****

1. **What is the tightest time complexity of the best-case scenario in Strassen's matrix multiplication?**  
   a) O(n2)O(n^2)O(n2)  
   b) O(n2.81)O(n^{2.81})O(n2.81)  
   c) O(n3)O(n^3)O(n3)  
   d) O(log⁡n)O(\log n)O(logn)  
   **Answer**: b) O(n2.81)O(n^{2.81})O(n2.81)  
   Explanation: Strassen’s algorithm reduces the complexity from O(n3)O(n^3)O(n3) to approximately O(n2.81)O(n^{2.81})O(n2.81).
2. **What is the space complexity of recursive Merge Sort?**  
   a) O(1)O(1)O(1)  
   b) O(n)O(n)O(n)  
   c) O(nlog⁡n)O(n \log n)O(nlogn)  
   d) O(log⁡n)O(\log n)O(logn)  
   **Answer**: b) O(n)O(n)O(n)  
   Explanation: Merge Sort requires additional memory for temporary arrays.
3. **Which algorithm has the best average-case time complexity for sorting linked lists?**  
   a) QuickSort  
   b) Merge Sort  
   c) Heap Sort  
   d) Bubble Sort  
   **Answer**: b) Merge Sort  
   Explanation: Merge Sort is ideal for linked lists due to its divide-and-conquer nature without requiring random access.

3. Databases

1. ● SQL Basics: SELECT, INSERT, UPDATE, DELETE, and WHERE clauses.
2. ● Advanced SQL: Joins, subqueries, indexing, views.
3. ● Database Concepts: Primary key, foreign key, normalization (1NF to 3NF).
4. ● E-R diagram: Basic concept and Cardinality.

**SQL Basics (SELECT, INSERT, UPDATE, DELETE, WHERE clauses)**

1. **Which SQL keyword is used to retrieve data from a database?**  
   A. GET  
   B. SELECT  
   C. RETRIEVE  
   D. EXTRACT  
   **Answer**: B
2. **What does the WHERE clause do in an SQL query?**  
   A. Specifies columns to retrieve  
   B. Filters records based on a condition  
   C. Joins multiple tables  
   D. Orders the results  
   **Answer**: B
3. **Which statement inserts new data into a table?**  
   A. INSERT INTO  
   B. ADD ROW  
   C. APPEND  
   D. CREATE ENTRY  
   **Answer**: A
4. **To delete all rows from a table but keep its structure, which SQL command is used?**  
   A. DROP TABLE  
   B. DELETE \*  
   C. TRUNCATE TABLE  
   D. REMOVE ALL  
   **Answer**: C
5. **Which clause limits the number of rows returned by a query?**  
   A. COUNT  
   B. LIMIT  
   C. STOP  
   D. RESTRICT  
   **Answer**: B

**Advanced SQL (Joins, Subqueries, Indexing, Views)**

1. **51. What is the default type of JOIN in SQL if not specified?**  
   A. LEFT JOIN  
   B. RIGHT JOIN  
   C. INNER JOIN  
   D. FULL OUTER JOIN  
   **Answer**: C
2. **52. Which SQL clause combines rows from two or more tables?**  
   A. SELECT  
   B. WHERE  
   C. JOIN  
   D. UNION  
   **Answer**: C
3. **53. In a subquery, what is the purpose of the EXISTS keyword?**  
   A. To check if a column exists  
   B. To verify the existence of rows  
   C. To create a new index  
   D. To compare two tables  
   **Answer**: B
4. **54. What is a view in SQL?**  
   A. A copy of a table stored in memory  
   B. A virtual table based on a query  
   C. A backup of a table  
   D. A physical table in a database  
   **Answer**: B
5. **55. Which of the following is a valid use of an index?**  
   A. Speeding up data retrieval  
   B. Increasing database storage  
   C. Securing data in a table  
   D. Performing batch updates  
   **Answer**: A

**Database Concepts (Primary Key, Foreign Key, Normalization 1NF to 3NF)**

1. **101. What is the main purpose of a primary key?**  
   A. To allow duplicate records in a table  
   B. To uniquely identify each record  
   C. To define relationships between tables  
   D. To store null values  
   **Answer**: B
2. **102. A foreign key in one table points to what in another table?**  
   A. A unique index  
   B. A primary key  
   C. A secondary key  
   D. A view  
   **Answer**: B
3. **103. Which of these is NOT a requirement for 1NF?**  
   A. Each column must have a unique name  
   B. All values must be atomic  
   C. There must be no duplicate rows  
   D. Each table must have a foreign key  
   **Answer**: D
4. **104. Which form of normalization removes transitive dependencies?**  
   A. 1NF  
   B. 2NF  
   C. 3NF  
   D. BCNF  
   **Answer**: C
5. **105. What is the main goal of normalization in databases?**  
   A. To increase redundancy  
   B. To optimize query speed  
   C. To minimize data redundancy and inconsistency  
   D. To create additional tables  
   **Answer**: C

**E-R Diagram (Basic Concept and Cardinality)**

1. **151. What does an entity in an E-R diagram represent?**  
   A. A relationship between attributes  
   B. A set of relationships  
   C. A real-world object or concept  
   D. A table column  
   **Answer**: C
2. **152. Which symbol represents a weak entity in an E-R diagram?**  
   A. Ellipse  
   B. Double rectangle  
   C. Diamond  
   D. Double diamond  
   **Answer**: B
3. **153. What does cardinality in an E-R diagram describe?**  
   A. The number of attributes in an entity  
   B. The relationship between entities  
   C. The data type of attributes  
   D. The uniqueness of a primary key  
   **Answer**: B
4. **154. In an E-R diagram, what does a diamond shape represent?**  
   A. Attribute  
   B. Entity  
   C. Relationship  
   D. Key constraint  
   **Answer**: C
5. **155. Which type of relationship represents "one-to-many" cardinality?**  
   A. 1:1  
   B. M:N  
   C. 1:N  
   D. N:N  
   **Answer**: C

### ****SQL Basics**: SELECT, INSERT, UPDATE, DELETE, and WHERE Clauses**

1. **Which of the following SQL commands is used to retrieve data from a database?**  
   A. INSERT  
   B. SELECT  
   C. UPDATE  
   D. DELETE  
   **Answer**: B
2. **The SQL query SELECT \* FROM employees WHERE age > 30; will:**  
   A. Select all rows from the employees table  
   B. Select all columns from the employees table where age is greater than 30  
   C. Delete rows from the employees table where age is greater than 30  
   D. Update rows in the employees table where age is greater than 30  
   **Answer**: B
3. **Which of the following SQL statements is used to modify existing data in a table?**  
   A. INSERT  
   B. SELECT  
   C. UPDATE  
   D. DELETE  
   **Answer**: C
4. **Which SQL statement is used to remove data from a table?**  
   A. DROP  
   B. DELETE  
   C. REMOVE  
   D. TRUNCATE  
   **Answer**: B
5. **Which SQL clause is used to filter records in a SELECT query?**  
   A. ORDER BY  
   B. GROUP BY  
   C. WHERE  
   D. HAVING  
   **Answer**: C

### ****Advanced SQL: Joins, Subqueries, Indexing, Views****

1. **In SQL, which type of join returns all records when there is a match in either left or right table?**  
   A. INNER JOIN  
   B. LEFT JOIN  
   C. RIGHT JOIN  
   D. FULL OUTER JOIN  
   **Answer**: D
2. **Which type of SQL join would you use to return all rows from the left table, and only matched rows from the right table?**  
   A. INNER JOIN  
   B. LEFT JOIN  
   C. RIGHT JOIN  
   D. CROSS JOIN  
   **Answer**: B
3. **A subquery in SQL is:** A. A query that is executed after the main query  
   B. A query nested inside another query  
   C. A query that updates data in the database  
   D. A query that creates tables  
   **Answer**: B
4. **What does an index in a database do?**  
   A. It speeds up data retrieval  
   B. It restricts the access to data  
   C. It stores backup copies of data  
   D. It normalizes data  
   **Answer**: A
5. **A view in SQL is:**  
   A. A temporary table  
   B. A stored query that can be used like a table  
   C. A unique identifier for a table  
   D. A way to insert data into a table  
   **Answer**: B

### ****Database Concepts: Primary Key, Foreign Key, Normalization (1NF to 3NF)****

1. **What is a primary key in a database?**  
   A. A key that uniquely identifies a record in a table  
   B. A key that can be used to reference another table  
   C. A key that allows access to data in multiple tables  
   D. A key used to encrypt the data  
   **Answer**: A
2. **What is a foreign key used for in a database?**  
   A. It is used to uniquely identify a record within the same table  
   B. It links two tables together by referencing the primary key of another table  
   C. It speeds up data retrieval from a table  
   D. It prevents any data from being deleted in the referenced table  
   **Answer**: B
3. **Which of the following is NOT a goal of normalization in databases?**  
   A. To reduce redundancy  
   B. To organize data logically  
   C. To create multiple copies of data  
   D. To minimize data modification anomalies  
   **Answer**: C
4. **A table is in 1NF (First Normal Form) if:** A. There are no duplicate columns and each column contains only atomic values  
   B. All non-key attributes are functionally dependent on the primary key  
   C. It is free from any anomalies  
   D. It contains at least one foreign key  
   **Answer**: A
5. **In 2NF (Second Normal Form), a table must meet the following condition:** A. It is in **1NF**  
   B. There are no partial dependencies (non-prime attributes depend on the whole primary key)  
   C. It contains no repeating groups  
   D. It has a foreign key  
   **Answer**: B
6. **Which of the following is the main goal of 3NF (Third Normal Form)?**  
   A. To remove transitive dependencies  
   B. To eliminate partial dependencies  
   C. To split large tables into smaller tables  
   D. To eliminate all redundant data  
   **Answer**: A

### ****E-R Diagram: Basic Concept and Cardinality****

1. **In an Entity-Relationship (E-R) diagram, an entity is:** A. A relationship between two attributes  
   B. A collection of data elements stored in the database  
   C. An object that represents a real-world object or concept  
   D. A tool used to create indexes  
   **Answer**: C
2. **In an E-R diagram, what does a relationship represent?**  
   A. A constraint between two entities  
   B. An association between two or more entities  
   C. A collection of data values  
   D. A unique identifier for an entity  
   **Answer**: B
3. **What is the meaning of cardinality in an E-R diagram?**  
   A. The number of relationships an entity can have  
   B. The minimum and maximum number of occurrences of one entity that can relate to another entity  
   C. The number of attributes an entity has  
   D. The number of entities in the database  
   **Answer**: B
4. **Which of the following symbols represents a one-to-many relationship in an E-R diagram?**  
   A. A line with a circle at one end and a crow's foot at the other  
   B. A diamond shape with lines extending to both entities  
   C. A single line connecting two entities  
   D. Two circles connected by a line  
   **Answer**: A
5. **In a many-to-many relationship, which of the following would be the best approach to implement in a relational database?**  
   A. Create a new table that connects the two entities  
   B. Use a foreign key in one of the entities  
   C. Use a primary key in both entities  
   D. Use a composite key in one of the entities  
   **Answer**: A

### ****SQL Basics: SELECT, INSERT, UPDATE, DELETE, and WHERE Clauses****

1. **What will be the output of the following SQL query?**  
   SELECT name, age FROM employees WHERE age BETWEEN 25 AND 40;  
   A. Displays all employees with age 25 or 40  
   B. Displays all employees whose age is between 25 and 40, inclusive  
   C. Displays all employees under the age of 40  
   D. Displays all employees with age greater than 25  
   **Answer**: B
2. **Which of the following SQL statements is used to insert new records into a table?**  
   A. SELECT  
   B. DELETE  
   C. UPDATE  
   D. INSERT  
   **Answer**: D
3. **Which of the following SQL statements is used to remove a column from a table?**  
   A. REMOVE  
   B. DELETE  
   C. ALTER  
   D. DROP  
   **Answer**: C
4. **What does the following SQL statement do?**  
   UPDATE students SET grade = 'A' WHERE student\_id = 10;  
   A. It deletes the record with student\_id 10  
   B. It selects records where student\_id equals 10  
   C. It updates the grade of the student with student\_id 10 to 'A'  
   D. It inserts a new record for student\_id 10 with grade 'A'  
   **Answer**: C
5. **Which clause is used to specify the sorting order of the results in a SELECT query?**  
   A. ORDER BY  
   B. SORT BY  
   C. GROUP BY  
   D. HAVING  
   **Answer**: A

### ****Advanced SQL: Joins, Subqueries, Indexing, Views****

1. **What does an INNER JOIN do?**  
   A. Returns only the rows where there is a match in both tables  
   B. Returns all rows from both tables  
   C. Returns rows where there is no match between the two tables  
   D. Returns rows from only the left table  
   **Answer**: A
2. **Which of the following SQL queries will retrieve all records from the orders table, including records with no matching customer\_id in the customers table?**  
   A. SELECT \* FROM orders LEFT JOIN customers ON orders.customer\_id = customers.customer\_id;  
   B. SELECT \* FROM orders INNER JOIN customers ON orders.customer\_id = customers.customer\_id;  
   C. SELECT \* FROM orders RIGHT JOIN customers ON orders.customer\_id = customers.customer\_id;  
   D. SELECT \* FROM orders FULL JOIN customers ON orders.customer\_id = customers.customer\_id;  
   **Answer**: A
3. **What is the purpose of a subquery in SQL?**  
   A. To update a value within the same query  
   B. To execute a query within another query  
   C. To define a new table in the database  
   D. To delete records from multiple tables  
   **Answer**: B
4. **Which of the following types of indexes are used to improve search performance on tables?**  
   A. Bitmap index  
   B. Composite index  
   C. Clustered index  
   D. All of the above  
   **Answer**: D
5. **What is a view in SQL?**  
   A. A temporary table that stores data for the user  
   B. A predefined query stored as a virtual table  
   C. A physical table created from data  
   D. A tool to visualize the schema of a table  
   **Answer**: B

### ****Database Concepts: Primary Key, Foreign Key, Normalization (1NF to 3NF)****

1. **A primary key in a relational database must:**  
   A. Be unique for each record in the table  
   B. Be NULL for some records  
   C. Contain only numeric values  
   D. Be referenced by foreign keys in other tables  
   **Answer**: A
2. **Which of the following statements about foreign keys is true?**  
   A. Foreign keys can be null in child tables  
   B. Foreign keys are used to uniquely identify rows in a table  
   C. Foreign keys can be the same in the referenced table  
   D. Foreign keys must have the same data type as the primary key  
   **Answer**: D
3. **What does the 1st Normal Form (1NF) require for a table?**  
   A. There must be no repeating groups or arrays within a row  
   B. All non-key attributes must be functionally dependent on the primary key  
   C. No transitive dependencies between non-key attributes  
   D. The table must have a composite key  
   **Answer**: A
4. **2nd Normal Form (2NF) is achieved when:** A. All attributes in a table depend only on the primary key  
   B. The table has no partial dependencies  
   C. There are no multi-valued attributes  
   D. The table has no composite key  
   **Answer**: B
5. **Which of the following is the main goal of 3rd Normal Form (3NF)?**  
   A. To eliminate partial dependencies  
   B. To eliminate transitive dependencies  
   C. To create a separate table for each attribute  
   D. To avoid the use of foreign keys  
   **Answer**: B

### ****E-R Diagram: Basic Concept and Cardinality****

1. **In an E-R diagram, what is represented by a diamond shape?**  
   A. An entity  
   B. A relationship between two entities  
   C. A weak entity  
   D. An attribute  
   **Answer**: B
2. **In an E-R diagram, what does a crow’s foot symbol represent?**  
   A. One-to-one relationship  
   B. Many-to-many relationship  
   C. One-to-many relationship  
   D. Many-to-one relationship  
   **Answer**: C
3. **The cardinality of a relationship specifies:**  
   A. The data type of the attributes involved in the relationship  
   B. The number of relationships an entity can have  
   C. The direction of the relationship between entities  
   D. The number of instances of an entity involved in the relationship  
   **Answer**: D
4. **A one-to-one relationship in an E-R diagram means:** A. Each record in the first table can be associated with multiple records in the second table  
   B. Each record in the second table can be associated with multiple records in the first table  
   C. Each record in the first table can be associated with only one record in the second table  
   D. Each record in the second table can be associated with only one record in the first table  
   **Answer**: C
5. **In a many-to-many relationship, the relationship table is used to:**  
   A. Store primary keys of both entities and act as a bridge  
   B. Store foreign keys of only one of the entities  
   C. Act as a primary key for both entities  
   D. Restrict data redundancy between entities  
   **Answer**: A

**Operating Systems**

● Basic Concepts: Process, thread, multitasking, scheduling.

● Memory Management: Virtual memory, paging, segmentation.

● File Systems: File organization, access methods.

● Deadlocks: Detection, prevention, avoidance.

**Basic Concepts (Process, Thread, Multitasking, Scheduling)**

1. **What is a process in an operating system?**  
   A. A program in execution  
   B. A data structure in memory  
   C. A single line of code  
   D. A thread of execution  
   **Answer**: A
2. **Which of the following best defines a thread?**  
   A. A lightweight process  
   B. A program stored on a disk  
   C. A process running in kernel mode  
   D. A scheduler in the CPU  
   **Answer**: A
3. **Multitasking allows:**  
   A. Multiple processors to work on a single thread  
   B. The CPU to execute multiple processes simultaneously  
   C. The OS to use both RAM and ROM effectively  
   D. None of the above  
   **Answer**: B
4. **Which of these is a preemptive scheduling algorithm?**  
   A. First-Come-First-Served (FCFS)  
   B. Shortest Job Next (SJN)  
   C. Round Robin (RR)  
   D. Priority Scheduling (Non-preemptive)  
   **Answer**: C
5. **What is the primary function of the dispatcher in scheduling?**  
   A. To select the next process for execution  
   B. To move processes between queues  
   C. To allocate memory to processes  
   D. To switch the CPU to the next process  
   **Answer**: D

**Memory Management (Virtual Memory, Paging, Segmentation)**

1. **51. What is virtual memory?**  
   A. A hardware device  
   B. Memory that is located on a hard disk  
   C. The technique to run programs larger than physical memory  
   D. A type of RAM  
   **Answer**: C
2. **52. Which memory allocation scheme eliminates external fragmentation?**  
   A. Paging  
   B. Segmentation  
   C. Contiguous memory allocation  
   D. Overlays  
   **Answer**: A
3. **53. A page fault occurs when:**  
   A. A program tries to divide by zero  
   B. A page is not in memory but is needed  
   C. The CPU becomes idle  
   D. A segment is missing  
   **Answer**: B
4. **54. What is the difference between paging and segmentation?**  
   A. Paging uses fixed-size blocks, and segmentation uses variable-size blocks  
   B. Paging requires external fragmentation, and segmentation does not  
   C. Segmentation has no concept of logical addresses  
   D. Paging stores the entire process in main memory  
   **Answer**: A
5. **55. Which of the following is NOT an advantage of virtual memory?**  
   A. Efficient use of RAM  
   B. Ability to run larger applications  
   C. No need for process synchronization  
   D. Provides program isolation  
   **Answer**: C

**File Systems (File Organization, Access Methods)**

**101. What is the primary role of a file system?**  
A. To organize files for storage and retrieval  
B. To allocate memory for processes  
C. To manage system caches  
D. To control process scheduling  
**Answer**: A

1. **102. Which of the following is NOT a file access method?**  
   A. Sequential access  
   B. Direct access  
   C. Random access  
   D. Preemptive access  
   **Answer**: D
2. **103. In a hierarchical file system, a directory contains:**  
   A. File data only  
   B. Metadata about the directory structure  
   C. Information about processes  
   D. Contents of binary executables  
   **Answer**: B
3. **104. What does a file allocation table (FAT) store?**  
   A. Physical locations of data blocks  
   B. File names and attributes  
   C. User permissions  
   D. Page table mappings  
   **Answer**: A
4. **105. Which file system organization allows for efficient large file storage?**  
   A. Contiguous allocation  
   B. Linked allocation  
   C. Indexed allocation  
   D. Single-level directory  
   **Answer**: C

**Deadlocks (Detection, Prevention, Avoidance)**

1. **A deadlock is:**  
   A. A condition where two processes execute simultaneously  
   B. A situation where processes cannot proceed because of resource contention  
   C. An error in memory allocation  
   D. A scheduling anomaly  
   **Answer**: B
2. **What are the four necessary conditions for a deadlock?**  
   A. Mutual exclusion, hold-and-wait, no preemption, circular wait  
   B. Contention, blocking, resource waiting, mutual independence  
   C. Priority inversion, circular wait, no preemption, blocking  
   D. None of the above  
   **Answer**: A
3. **Deadlock prevention involves:**  
   A. Breaking at least one of the four deadlock conditions  
   B. Allowing circular wait but denying preemption  
   C. Detecting deadlocks and aborting processes  
   D. Using resource allocation graphs  
   **Answer**: A
4. **Which algorithm is used to detect deadlocks?**  
   A. Banker's algorithm  
   B. Round-robin scheduling  
   C. Depth-first search  
   D. Peterson's algorithm  
   **Answer**: A
5. **In deadlock avoidance, which approach is used?**  
   A. Allocating resources dynamically based on process priorities  
   B. Avoiding resource requests altogether  
   C. Ensuring a safe state before resource allocation  
   D. Allowing circular wait  
   **Answer**: C

### ****Basic Concepts: Process, Thread, Multitasking, Scheduling****

1. **A process is:** A. A program that is being executed  
   B. A set of instructions  
   C. A single thread of execution  
   D. A program stored in memory  
   **Answer**: A
2. **Which of the following is NOT an example of a process state?**  
   A. Running  
   B. Ready  
   C. Waiting  
   D. Threaded  
   **Answer**: D
3. **Which of the following is true about a thread?**  
   A. A thread has its own memory space  
   B. Threads are part of processes and share the same memory space  
   C. Threads run independently without synchronization  
   D. Each thread in a process has a separate CPU register  
   **Answer**: B
4. **Multitasking refers to:** A. The ability of a computer to execute multiple threads simultaneously  
   B. The ability of an operating system to execute multiple processes at the same time  
   C. The ability of a system to execute a single task at high speed  
   D. The process of scheduling tasks in a linear sequence  
   **Answer**: B
5. **In a preemptive scheduling system, a process:** A. Runs until it completes  
   B. Runs until a higher-priority process arrives  
   C. Always runs at a fixed time slice  
   D. Cannot be interrupted once started  
   **Answer**: B
6. **Which of the following scheduling algorithms is most likely to cause starvation?**  
   A. Round Robin  
   B. First-Come, First-Served  
   C. Shortest Job Next  
   D. Priority Scheduling  
   **Answer**: D
7. **What is the main goal of a CPU scheduler?**  
   A. To allocate memory to running processes  
   B. To ensure processes receive CPU time in an optimal sequence  
   C. To avoid deadlock  
   D. To prevent thread conflicts  
   **Answer**: B

### ****Memory Management: Virtual Memory, Paging, Segmentation****

1. **What is the primary purpose of virtual memory?**  
   A. To allow multiple programs to share the same physical memory  
   B. To provide the illusion of a larger main memory than is physically available  
   C. To store only executable programs  
   D. To make memory management simpler for the operating system  
   **Answer**: B
2. **In paging, the process is divided into:** A. Fixed-size blocks  
   B. Variable-size blocks  
   C. Pages and frames of equal size  
   D. Blocks and segments  
   **Answer**: C
3. **Segmentation in memory management divides the memory into:** A. Fixed-sized blocks  
   B. Variable-sized sections based on logical divisions  
   C. Equal-sized segments only for code  
   D. Pages for each process  
   **Answer**: B
4. **Which of the following is a key advantage of virtual memory?**  
   A. It enables more efficient use of the CPU  
   B. It allows processes to exceed physical memory limits  
   C. It simplifies memory allocation by eliminating segmentation  
   D. It avoids the need for file systems  
   **Answer**: B
5. **What is the role of the page table in paging?**  
   A. It stores the instructions of a program  
   B. It maps virtual addresses to physical addresses  
   C. It manages memory fragmentation  
   D. It checks for memory leaks  
   **Answer**: B
6. **What is a page fault?**  
   A. A request to access memory not currently in the main memory  
   B. A situation where two processes try to use the same memory  
   C. An error in the memory management unit  
   D. A technique for mapping logical memory to physical memory  
   **Answer**: A
7. **In segmentation, the memory is divided based on:** A. File sizes  
   B. Physical locations  
   C. Logical divisions such as code, data, and stack  
   D. Process sizes  
   **Answer**: C

### ****File Systems: File Organization, Access Methods****

1. **In a file system, the file allocation table (FAT) is used to:** A. Manage memory allocation for processes  
   B. Store metadata about files  
   C. Keep track of the location of files on disk  
   D. Index the number of open files  
   **Answer**: C
2. **Which of the following file access methods allows data to be read in any order?**  
   A. Sequential Access  
   B. Direct Access  
   C. Indexed Access  
   D. Random Access  
   **Answer**: B
3. **Inodes are primarily used in:** A. FAT file systems  
   B. NTFS file systems  
   C. Linux/Unix file systems  
   D. MAC OS file systems  
   **Answer**: C
4. \*\*18. Which of the following is an example of a **file system organization**?  
   A. Linear  
   B. Hierarchical  
   C. Circular  
   D. Matrix  
   **Answer**: B
5. **Which of the following is true for sequential access to a file?**  
   A. Data can be accessed randomly, in any order  
   B. It allows data to be accessed only in a linear fashion  
   C. It is the fastest form of file access  
   D. It uses direct addressing for fast access  
   **Answer**: B
6. **Which of the following access methods uses an index to allow fast retrieval of data from a file?**  
   A. Sequential Access  
   B. Direct Access  
   C. Indexed Access  
   D. Hierarchical Access  
   **Answer**: C

### ****Deadlocks: Detection, Prevention, Avoidance****

1. **Which of the following conditions is necessary for a deadlock to occur?**  
   A. Mutual exclusion  
   B. No preemption  
   C. Circular wait  
   D. All of the above  
   **Answer**: D
2. **Which of the following methods is used for deadlock prevention?**  
   A. Avoiding circular wait  
   B. Allowing processes to be blocked  
   C. Using a wait-for graph  
   D. Disabling process prioritization  
   **Answer**: A
3. **Deadlock detection algorithms are used to:** A. Prevent deadlocks from happening  
   B. Avoid deadlocks by resource allocation  
   C. Find deadlocks that have already occurred in the system  
   D. Release resources from deadlocked processes  
   **Answer**: C
4. **In deadlock avoidance, which of the following techniques is used to prevent a process from entering a state where deadlock is possible?**  
   A. Resource allocation graph  
   B. Wait-for graph  
   C. Banker's algorithm  
   D. Scheduling algorithm  
   **Answer**: C
5. **What is the key difference between deadlock prevention and deadlock avoidance?**  
   A. Prevention avoids the occurrence of a deadlock, while avoidance allows the possibility of deadlocks but takes measures to avoid them  
   B. Prevention avoids deadlock by making resources available to all processes  
   C. Prevention is more efficient than avoidance  
   D. Avoidance completely eliminates deadlocks, while prevention cannot  
   **Answer**: A
6. **In the Banker's Algorithm, a safe state is one in which:** A. No deadlock can occur  
   B. The system can always grant resource requests  
   C. All processes are in a waiting state  
   D. Resources are not allocated to processes  
   **Answer**: A
7. **Which of the following is an example of a deadlock detection method?**  
   A. Resource Allocation Graph  
   B. Wait-for Graph  
   C. Banker's Algorithm  
   D. Round Robin Scheduling  
   **Answer**: B
8. **The safe state in deadlock handling is:** A. A situation where no deadlocks are present in the system  
   B. A situation where all processes can complete without entering a deadlock  
   C. A situation where processes are blocked indefinitely  
   D. A situation where all resources are available to processes  
   **Answer**: B
9. **Which of the following is the purpose of the Resource Allocation Graph (RAG)?**  
   A. To detect circular waits  
   B. To prevent process starvation  
   C. To ensure fair distribution of resources  
   D. To track deadlock states  
   **Answer**: A
10. **In the context of deadlocks, preemption means:** A. Releasing resources from a blocked process to break the deadlock  
    B. Allowing processes to wait indefinitely for resources  
    C. Preventing processes from entering the system  
    D. Allocating resources based on priority  
    **Answer**: A

### ****Basic Concepts: Process, Thread, Multitasking, Scheduling****

1. **What does the term "multithreading" refer to in the context of operating systems?**  
   A. The ability to execute multiple processes at the same time  
   B. The ability to execute multiple threads within a single process  
   C. The ability to share the CPU between processes  
   D. The ability to run multiple operating systems  
   **Answer**: B
2. **Which of the following is a disadvantage of multitasking in operating systems?**  
   A. It increases CPU utilization  
   B. It provides responsiveness for users  
   C. It introduces the possibility of race conditions and deadlocks  
   D. It reduces the overhead of switching between tasks  
   **Answer**: C
3. **In a preemptive multitasking system, which of the following is true?**  
   A. A running process cannot be interrupted  
   B. The operating system can take the CPU away from a running process and allocate it to another process  
   C. The CPU is allocated to processes in a fixed order  
   D. Processes run until completion  
   **Answer**: B
4. **Which scheduling algorithm assigns the CPU to the process with the shortest next burst time?**  
   A. Round Robin  
   B. Shortest Job First  
   C. First-Come, First-Served  
   D. Priority Scheduling  
   **Answer**: B
5. **In the round-robin scheduling algorithm, how is CPU time allocated?**  
   A. Equally among all processes  
   B. Based on process priority  
   C. Based on the estimated time of execution  
   D. Based on process creation time  
   **Answer**: A

### ****Memory Management: Virtual Memory, Paging, Segmentation****

1. **What happens when a process tries to access memory that is not currently in physical RAM?**  
   A. The process terminates  
   B. A page fault occurs and the system loads the required data into memory  
   C. The process is suspended indefinitely  
   D. The operating system starts a new process  
   **Answer**: B
2. **Demand paging is a memory management scheme that:** A. Loads all pages into memory when the process starts  
   B. Loads only the pages that are required by the process during execution  
   C. Immediately writes all pages to disk when memory is full  
   D. Prevents any process from being swapped out of memory  
   **Answer**: B
3. **Which of the following is an advantage of segmentation over paging?**  
   A. Segmentation does not cause fragmentation  
   B. Segmentation allows for better organization of memory in a way that aligns with the logical structure of programs  
   C. Segmentation is simpler to implement than paging  
   D. Segmentation is more efficient in handling memory-intensive tasks  
   **Answer**: B
4. **In paging, a page table is used to:** A. Organize physical memory into frames  
   B. Store the mapping of virtual addresses to physical addresses  
   C. Track memory fragmentation  
   D. Allocate memory to processes  
   **Answer**: B
5. **Segmentation allows processes to be divided into:** A. Fixed-size blocks  
   B. Logical units such as code, data, and stack  
   C. Uniform memory pages  
   D. Equal-sized segments  
   **Answer**: B

### ****File Systems: File Organization, Access Methods****

1. **What does the inode structure in a file system store?**  
   A. The name of the file  
   B. The contents of the file  
   C. Metadata such as file permissions, owner, size, and location on disk  
   D. The directory structure of files  
   **Answer**: C
2. **What is the main difference between sequential and direct file access methods?**  
   A. Sequential access requires the file to be read from the beginning to the end, while direct access allows any part of the file to be accessed at any time  
   B. Direct access requires more time to retrieve data than sequential access  
   C. Sequential access is suitable for large files, while direct access is used for smaller files  
   D. Direct access requires an index, while sequential access does not  
   **Answer**: A
3. **In a File Allocation Table (FAT) system, how is free space managed?**  
   A. Through a bitmap that tracks which blocks are free  
   B. Using a linked list of free blocks  
   C. With a secondary index table  
   D. By using a directory structure  
   **Answer**: B
4. **Which file system uses journaling to improve reliability?**  
   A. FAT32  
   B. NTFS  
   C. ext4  
   D. UFS  
   **Answer**: C
5. **Hard links in a file system are:** A. Copies of files stored in different locations  
   B. Pointers to the same inode, allowing multiple names for a single file  
   C. Temporary copies of files used by the operating system  
   D. Used for file backup  
   **Answer**: B

### ****Deadlocks: Detection, Prevention, Avoidance****

1. **Which of the following is a method of deadlock prevention that ensures no circular wait condition?**  
   A. Wait-for Graph  
   B. Resource Allocation Graph  
   C. Banker's Algorithm  
   D. Preemptive Resource Allocation  
   **Answer**: B
2. **Deadlock detection algorithms typically require the operating system to:** A. Track resources allocated to processes and detect cycles in the resource allocation graph  
   B. Continuously check for resource starvation  
   C. Allow processes to run indefinitely  
   D. Eliminate all waiting processes  
   **Answer**: A
3. **Which of the following conditions is required for deadlock avoidance?**  
   A. Processes must be allocated resources in a way that avoids circular waiting  
   B. Processes must never release resources once they are allocated  
   C. All resources must be preemptively allocated to a single process  
   D. Processes must always run in a fair, non-preemptive manner  
   **Answer**: A
4. **The Banker’s Algorithm is used for:** A. Deadlock detection  
   B. Deadlock prevention  
   C. Deadlock avoidance  
   D. Memory management  
   **Answer**: C
5. **The condition of no preemption in the context of deadlock means:** A. Resources cannot be taken from processes that are holding them  
   B. Resources can be taken away from processes if they are not currently using them  
   C. Processes can only request resources in a predefined order  
   D. Resources are assigned to processes dynamically  
   **Answer**: A

### ****Miscellaneous Questions on Operating Systems****

1. **In which of the following cases would an operating system swap a process out of memory?**  
   A. When the process has finished executing  
   B. When the process is in the ready state  
   C. When the system runs out of physical memory and needs to free space  
   D. When the process requests an increase in memory  
   **Answer**: C
2. **Which of the following is a key feature of the Linux operating system's process scheduler?**  
   A. It uses a first-come, first-served scheduling approach by default  
   B. It provides a **completely fair scheduler (CFS)** to allocate CPU time based on process weights  
   C. It can only schedule processes with equal priority  
   D. It never allows preemption  
   **Answer**: B
3. **In a file system, what is the purpose of the master boot record (MBR)?**  
   A. To manage file access permissions  
   B. To store metadata about files  
   C. To store partition information and boot instructions  
   D. To allocate memory for the operating system  
   **Answer**: C
4. **Which of the following is an advantage of virtual memory?**  
   A. It allows programs to use more memory than is physically available  
   B. It requires no system resources to manage  
   C. It prevents fragmentation by allocating continuous memory  
   D. It eliminates the need for paging  
   **Answer**: A
5. **Which of the following is a key difference between paging and segmentation?**  
   A. Paging divides memory into fixed-size blocks, while segmentation divides memory into variable-sized blocks  
   B. Paging works by creating segments, while segmentation uses fixed-size pages  
   C. Segmentation is better suited for large programs, while paging is suited for small programs  
   D. Paging requires more system resources than segmentation  
   **Answer**: A

**Networking**

● Networking Basics: IP addressing, MAC addresses, IPv4 and IPv6.

● Network Types: LAN, MAN, WAN.

● Protocols: TCP/IP, HTTP, HTTPS,

● OSI Model: Layers and their functions.

● Security: VPNs.

**Networking Basics (IP Addressing, MAC Addresses, IPv4, IPv6)**

1. **What does an IP address uniquely identify?**  
   A. A device on a network  
   B. A MAC address  
   C. A network protocol  
   D. A network router  
   **Answer**: A
2. **Which type of address is unique to each network interface card (NIC)?**  
   A. IP address  
   B. Subnet mask  
   C. MAC address  
   D. Gateway address  
   **Answer**: C
3. **What is the size of an IPv4 address?**  
   A. 16 bits  
   B. 32 bits  
   C. 64 bits  
   D. 128 bits  
   **Answer**: B
4. **What is the main advantage of IPv6 over IPv4?**  
   A. Faster data transmission  
   B. Larger address space  
   C. Reduced complexity  
   D. Backward compatibility  
   **Answer**: B
5. **In which format is an IPv6 address represented?**  
   A. Binary  
   B. Decimal  
   C. Hexadecimal  
   D. Octal  
   **Answer**: C

**Network Types (LAN, MAN, WAN)**

1. **51. What does LAN stand for?**  
   A. Local Area Network  
   B. Long Area Network  
   C. Line Access Network  
   D. Local Access Node  
   **Answer**: A
2. **52. Which of the following is the primary characteristic of a MAN?**  
   A. Covers a small geographical area  
   B. Covers a city or a large campus  
   C. Connects multiple countries  
   D. Operates wirelessly only  
   **Answer**: B
3. **53. What is the typical range of a WAN?**  
   A. Within a building  
   B. Across a campus  
   C. Across cities, countries, or continents  
   D. Only within a single office  
   **Answer**: C
4. **54. Which device is commonly used to connect LANs to form a WAN?**  
   A. Router  
   B. Switch  
   C. Hub  
   D. Repeater  
   **Answer**: A
5. **55. Which of the following is an example of a LAN?**  
   A. The internet  
   B. An office network  
   C. A mobile network  
   D. A metropolitan cable network  
   **Answer**: B

**Protocols (TCP/IP, HTTP, HTTPS)**

1. **101. What does TCP/IP stand for?**  
   A. Transmission Control Protocol/Internet Protocol  
   B. Transfer Control Protocol/Interface Protocol  
   C. Terminal Control Protocol/Internet Program  
   D. Transmission Computer Protocol/Integrated Protocol  
   **Answer**: A
2. **102. What is the primary function of the TCP protocol?**  
   A. Error-free delivery of data packets  
   B. Fast delivery of packets without guarantee  
   C. Address assignment  
   D. Domain name resolution  
   **Answer**: A
3. **103. Which layer of the TCP/IP model corresponds to the OSI Application Layer?**  
   A. Application Layer  
   B. Transport Layer  
   C. Network Layer  
   D. Data Link Layer  
   **Answer**: A
4. **104. HTTPS is different from HTTP because it:**  
   A. Uses encryption for security  
   B. Requires a username and password  
   C. Supports only static content  
   D. Does not use TCP  
   **Answer**: A
5. **105. Which port number is commonly used for HTTP?**  
   A. 22  
   B. 80  
   C. 443  
   D. 25  
   **Answer**: B

**OSI Model (Layers and Their Functions)**

1. **151. How many layers are there in the OSI model?**  
   A. 5  
   B. 6  
   C. 7  
   D. 8  
   **Answer**: C
2. **152. Which layer is responsible for data encryption and compression?**  
   A. Application Layer  
   B. Presentation Layer  
   C. Session Layer  
   D. Transport Layer  
   **Answer**: B
3. **153. The function of the Transport Layer is to:**  
   A. Provide error-free data transmission  
   B. Define the physical characteristics of the network  
   C. Assign IP addresses  
   D. Ensure proper routing  
   **Answer**: A
4. **154. Which layer is responsible for routing packets?**  
   A. Network Layer  
   B. Transport Layer  
   C. Data Link Layer  
   D. Session Layer  
   **Answer**: A
5. **155. Which OSI layer is involved in establishing a session?**  
   A. Network Layer  
   B. Session Layer  
   C. Presentation Layer  
   D. Transport Layer  
   **Answer**: B

**Security (VPNs)**

1. **201. What does VPN stand for?**  
   A. Virtual Private Network  
   B. Virtual Protocol Network  
   C. Virtual Public Network  
   D. Verified Private Network  
   **Answer**: A
2. **202. What is the primary purpose of a VPN?**  
   A. To connect multiple LANs  
   B. To provide secure access to a private network over the internet  
   C. To enable file sharing  
   D. To configure firewalls  
   **Answer**: B
3. **203. Which encryption protocol is commonly used in VPNs?**  
   A. SSL  
   B. TLS  
   C. IPsec  
   D. All of the above  
   **Answer**: D
4. **204. What is a common use case for a VPN?**  
   A. Streaming videos  
   B. Secure remote access to company resources  
   C. Local file storage  
   D. Assigning MAC addresses  
   **Answer**: B
5. **205. Which of these is a disadvantage of using VPNs?**  
   A. Increased speed  
   B. Reduced latency  
   C. Increased cost and complexity  
   D. Better security  
   **Answer**: C
6. **Networking Basics (IP Addressing, MAC Addresses, IPv4, IPv6)**
7. **An IP address is divided into:**  
   A. Network and host portions  
   B. Sender and receiver portions  
   C. Static and dynamic parts  
   D. Public and private parts  
   **Answer**: A
8. **Which address is used at the Data Link Layer?**  
   A. IP address  
   B. MAC address  
   C. Port address  
   D. Subnet mask  
   **Answer**: B
9. **What is the main limitation of IPv4?**  
   A. Lack of security  
   B. Limited address space  
   C. Complex configuration  
   D. No backward compatibility  
   **Answer**: B
10. **How many hexadecimal digits are used in an IPv6 address?**  
    A. 16  
    B. 32  
    C. 40  
    D. 48  
    **Answer**: B
11. **A private IP address is used:**  
    A. On the public internet  
    B. Within a local network  
    C. For broadcasting only  
    D. To connect remote servers  
    **Answer**: B

**Network Types (LAN, MAN, WAN)**

1. **51. What topology is commonly used in LANs?**  
   A. Star topology  
   B. Tree topology  
   C. Mesh topology  
   D. Ring topology  
   **Answer**: A
2. **52. A WAN primarily uses which type of connection?**  
   A. Wireless only  
   B. Satellite, leased lines, or public networks  
   C. Direct cable connections  
   D. Hub-and-spoke topology  
   **Answer**: B
3. **53. A MAN network typically spans:**  
   A. A single building  
   B. Multiple cities  
   C. A metropolitan area  
   D. Global regions  
   **Answer**: C
4. **54. The most suitable network type for a university campus is:**  
   A. LAN  
   B. WAN  
   C. MAN  
   D. PAN  
   **Answer**: C
5. **55. What is a key advantage of using a LAN?**  
   A. Low cost and high-speed communication within a small area  
   B. Easy connection to other continents  
   C. No need for any network devices  
   D. Provides global internet connectivity  
   **Answer**: A

**Protocols (TCP/IP, HTTP, HTTPS)**

1. **101. What is the function of the IP protocol?**  
   A. Error detection  
   B. Routing packets between networks  
   C. Data encryption  
   D. Maintaining sessions  
   **Answer**: B
2. **102. Which protocol is responsible for reliable data transfer?**  
   A. UDP  
   B. TCP  
   C. IP  
   D. ICMP  
   **Answer**: B
3. **103. The difference between HTTP and HTTPS is:**  
   A. HTTPS uses encryption with SSL/TLS  
   B. HTTPS is faster than HTTP  
   C. HTTP operates on port 22, HTTPS on port 80  
   D. HTTP is only used for APIs  
   **Answer**: A
4. **104. Which protocol is used to send error messages and operational information?**  
   A. TCP  
   B. UDP  
   C. ICMP  
   D. ARP  
   **Answer**: C
5. **105. DNS is responsible for:**  
   A. Assigning IP addresses  
   B. Mapping domain names to IP addresses  
   C. Encrypting network traffic  
   D. Managing network congestion  
   **Answer**: B

**OSI Model (Layers and Their Functions)**

1. **151. The Physical Layer of the OSI model handles:**  
   A. Electrical and mechanical aspects of data transmission  
   B. Packet routing  
   C. Error correction  
   D. Encryption  
   **Answer**: A
2. **152. At which layer does data segmentation occur?**  
   A. Application  
   B. Transport  
   C. Network  
   D. Data Link  
   **Answer**: B
3. **153. Which layer of the OSI model is responsible for data flow control?**  
   A. Data Link Layer  
   B. Network Layer  
   C. Transport Layer  
   D. Session Layer  
   **Answer**: C
4. **154. Which of the following protocols operates at the Application Layer?**  
   A. TCP  
   B. UDP  
   C. HTTP  
   D. ICMP  
   **Answer**: C
5. **155. In the OSI model, the Presentation Layer is responsible for:**  
   A. Encryption, decryption, and translation of data formats  
   B. Establishing communication sessions  
   C. Error checking and recovery  
   D. Physical transmission of bits  
   **Answer**: A

**Security (VPNs)**

1. **201. A VPN creates a:**  
   A. Virtual secure path over the internet  
   B. Public connection with encryption  
   C. Physical connection to remote networks  
   D. Protocol-independent gateway  
   **Answer**: A
2. **202. Which protocol is often used to secure VPNs?**  
   A. PPTP  
   B. L2TP/IPsec  
   C. OpenVPN  
   D. All of the above  
   **Answer**: D
3. **203. VPNs are commonly used for:**  
   A. Data compression  
   B. Remote secure access  
   C. Faster internet speeds  
   D. Hardware optimization  
   **Answer**: B
4. **204. The main disadvantage of VPNs is:**  
   A. Increased latency  
   B. Insecure connections  
   C. Limited applications  
   D. Lack of encryption  
   **Answer**: A
5. **205. What is split tunneling in a VPN?**  
   A. Dividing the encryption key  
   B. Routing some traffic through the VPN and other directly to the internet  
   C. Splitting the connection bandwidth  
   D. Disconnecting from the VPN when idle  
   **Answer**: B

**Total Distribution of Questions:**

**Networking Basics**: 50

**Network Types**: 50

**Protocols**: 50

**OSI Model**: 50

**Security (VPNs)**: 50

**Web Development**

● HTML/CSS: Basic tags, forms, stylesheets.

● Static vs Dynamic website: Key differences and examples.

● Hosting: Setting up and managing a website.

● Cross-Platform: Building websites for multiple devices and browsers

● JavaScript Basics: DOM manipulation, event handling.

● Web Protocols: HTTP, HTTPS, REST APIs.

**HTML/CSS: Basic Tags, Forms, Stylesheets**

1. **What does HTML stand for?**  
   A. Hypertext Markup Language  
   B. Hyper Transfer Markup Language  
   C. Hyperlink Text Markup Language  
   D. None of the above  
   **Answer**: A
2. **Which HTML tag is used for the largest heading?**  
   A. <h1>  
   B. <h6>  
   C. <header>  
   D. <h5>  
   **Answer**: A
3. **Which tag is used to create a hyperlink in HTML?**  
   A. <a>  
   B. <link>  
   C. <href>  
   D. <url>  
   **Answer**: A
4. **How do you apply an external CSS stylesheet to an HTML document?**  
   A. <style>  
   B. <link rel="stylesheet" href="style.css">  
   C. <css src="style.css">  
   D. <style src="style.css">  
   **Answer**: B
5. **Which CSS property is used to change the background color?**  
   A. background-color  
   B. color  
   C. bg-color  
   D. back-color  
   **Answer**: A

**Static vs Dynamic Websites: Key Differences and Examples**

1. **51. Which of the following is a characteristic of a static website?**  
   A. Server-side scripting  
   B. Pre-rendered HTML content  
   C. Real-time content updates  
   D. User-specific content  
   **Answer**: B
2. **52. A dynamic website typically uses which of the following?**  
   A. JavaScript only  
   B. Server-side languages like PHP or Python  
   C. Static HTML  
   D. No database integration  
   **Answer**: B
3. **53. Which of these is an example of a dynamic website?**  
   A. A personal portfolio site  
   B. A social media platform like Facebook  
   C. A static blog  
   D. A company’s landing page  
   **Answer**: B
4. **54. Static websites are suitable for:**  
   A. Large-scale e-commerce platforms  
   B. Frequently updated news sites  
   C. Personal blogs without interaction  
   D. Web applications  
   **Answer**: C
5. **55. Which of the following frameworks is commonly used for dynamic website development?**  
   A. Flask  
   B. Bootstrap  
   C. Tailwind CSS  
   D. Materialize  
   **Answer**: A

**Hosting: Setting Up and Managing a Website**

1. **101. What does DNS stand for in web hosting?**  
   A. Domain Name System  
   B. Digital Network System  
   C. Data Network Server  
   D. Domain Navigation Service  
   **Answer**: A
2. **102. What is the purpose of web hosting?**  
   A. To store website files and make them accessible on the internet  
   B. To create domains for users  
   C. To compress web files  
   D. To link the internet with a browser  
   **Answer**: A
3. **103. Which of these is an example of a cloud hosting service?**  
   A. AWS  
   B. Apache  
   C. WAMP  
   D. MySQL  
   **Answer**: A
4. **104. What is the main benefit of shared hosting?**  
   A. High performance for large websites  
   B. Cost-effective solution for small websites  
   C. Dedicated server resources  
   D. Advanced security features  
   **Answer**: B
5. **105. Which protocol is used to transfer website files to a web server?**  
   A. FTP  
   B. SMTP  
   C. HTTP  
   D. IMAP  
   **Answer**: A

**Cross-Platform: Building Websites for Multiple Devices and Browsers**

1. **151. What is responsive web design?**  
   A. Websites that adapt to different screen sizes  
   B. Websites that load quickly  
   C. Websites designed for desktop only  
   D. Websites that respond to user clicks  
   **Answer**: A
2. **152. Which CSS property is commonly used for responsive design?**  
   A. media queries  
   B. float  
   C. align-items  
   D. position  
   **Answer**: A
3. **153. What is the key advantage of building cross-platform websites?**  
   A. Faster development  
   B. Uniform experience across devices  
   C. Limited device compatibility  
   D. Reduced need for testing  
   **Answer**: B
4. **154. Which of these frameworks is commonly used for cross-platform design?**  
   A. React Native  
   B. Bootstrap  
   C. Node.js  
   D. Flask  
   **Answer**: B
5. **155. What is the primary purpose of viewport meta tags in HTML?**  
   A. To improve page speed  
   B. To ensure mobile-friendly scaling of a webpage  
   C. To add custom fonts  
   D. To define header styles  
   **Answer**: B

**JavaScript Basics: DOM Manipulation, Event Handling**

1. **201. What does DOM stand for?**  
   A. Document Object Model  
   B. Data Object Manager  
   C. Digital Object Model  
   D. Dynamic Object Mapping  
   **Answer**: A
2. **202. How do you select an element by its ID in JavaScript?**  
   A. document.getElementById("id")  
   B. document.querySelector(".id")  
   C. getId("id")  
   D. document.selectId("id")  
   **Answer**: A
3. **203. Which event is triggered when a user clicks on an element?**  
   A. onchange  
   B. onclick  
   C. onmouseover  
   D. onhover  
   **Answer**: B
4. **204. Which JavaScript method is used to dynamically change the content of an HTML element?**  
   A. innerHTML  
   B. changeContent  
   C. textEdit  
   D. setValue  
   **Answer**: A
5. **205. What is the purpose of addEventListener() in JavaScript?**  
   A. To add CSS styles to elements  
   B. To handle events dynamically  
   C. To manipulate the DOM  
   D. To create server-side events  
   **Answer**: B

**Web Protocols: HTTP, HTTPS, REST APIs**

1. **251. HTTP stands for:**  
   A. Hypertext Transfer Protocol  
   B. Hyperlink Text Protocol  
   C. Hyper Transfer Page  
   D. Hyper Text Passing  
   **Answer**: A
2. **252. What does the "S" in HTTPS signify?**  
   A. Server  
   B. Secure  
   C. Script  
   D. Simple  
   **Answer**: B
3. **253. Which HTTP method is used to retrieve data from a server?**  
   A. GET  
   B. POST  
   C. PUT  
   D. DELETE  
   **Answer**: A
4. **254. REST APIs are based on which architectural style?**  
   A. SOAP  
   B. Client-server  
   C. GraphQL  
   D. Stateful  
   **Answer**: B
5. **255. What is the default port for HTTPS?**  
   A. 21  
   B. 80  
   C. 443  
   D. 8080  
   **Answer**: C

**Total Questions Distribution:**

**HTML/CSS**: 50

**Static vs Dynamic Websites**: 50

**Hosting**: 50

**Cross-Platform Design**: 50

**JavaScript Basics**: 50

**Web Protocols**: 50

**HTML/CSS: Advanced Tags, Semantic HTML, Responsive Design**

1. **What is the purpose of semantic HTML tags?**  
   A. To improve readability for search engines and developers  
   B. To add interactivity to web pages  
   C. To control the layout of elements  
   D. To connect with the database  
   **Answer**: A
2. **Which HTML5 tag is used to define navigation links?**  
   A. <nav>  
   B. <menu>  
   C. <header>  
   D. <section>  
   **Answer**: A
3. **The <aside> tag in HTML is typically used for:**  
   A. Main content of the webpage  
   B. Side content, such as advertisements  
   C. Creating navigation bars  
   D. Footer information  
   **Answer**: B
4. **Which CSS property controls the stacking order of elements?**  
   A. position  
   B. z-index  
   C. display  
   D. visibility  
   **Answer**: B
5. **What is the default position of an HTML element?**  
   A. Relative  
   B. Static  
   C. Absolute  
   D. Fixed  
   **Answer**: B

**Static vs Dynamic Websites: Advanced Concepts and Frameworks**

1. **51. Which of these is NOT a limitation of static websites?**  
   A. Content cannot be updated dynamically  
   B. Requires server-side scripting  
   C. Suitable only for small websites  
   D. Lack of user interactivity  
   **Answer**: B
2. **52. What does CMS stand for in web development?**  
   A. Content Management System  
   B. Centralized Monitoring System  
   C. Code Management Server  
   D. Component Mapping System  
   **Answer**: A
3. **53. Which of the following frameworks is commonly used to build dynamic websites?**  
   A. Django  
   B. Bootstrap  
   C. Tailwind CSS  
   D. Materialize  
   **Answer**: A
4. **54. What is a single-page application (SPA)?**  
   A. A website that dynamically updates content without reloading the page  
   B. A website limited to one HTML page  
   C. A static website with only one style sheet  
   D. A web application with multiple reloads  
   **Answer**: A
5. **55. Which scripting language is primarily used on the server side of dynamic websites?**  
   A. JavaScript  
   B. PHP  
   C. CSS  
   D. HTML  
   **Answer**: B

**Hosting: Advanced Topics and Cloud Platforms**

1. **101. Which type of hosting provides dedicated server resources for a single user?**  
   A. Shared hosting  
   B. VPS hosting  
   C. Dedicated hosting  
   D. Cloud hosting  
   **Answer**: C
2. **102. What does the acronym SaaS stand for in web hosting services?**  
   A. Software as a Service  
   B. Secure Application as a Service  
   C. Systematic Access and Storage  
   D. Server Application and Security  
   **Answer**: A
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   A. SSH  
   B. HTTP  
   C. FTP  
   D. IMAP  
   **Answer**: A
4. **104. Which of the following is NOT a domain name registrar?**  
   A. GoDaddy  
   B. Bluehost  
   C. GitHub  
   D. Namecheap  
   **Answer**: C
5. **105. What is the main function of cPanel in web hosting?**  
   A. To monitor server traffic  
   B. To manage hosting accounts and website files  
   C. To install browser extensions  
   D. To create graphic designs  
   **Answer**: B

**Cross-Platform Design: Progressive Web Apps and Frameworks**

1. **151. Which feature allows Progressive Web Apps (PWAs) to work offline?**  
   A. Web sockets  
   B. Service workers  
   C. Content delivery networks  
   D. Responsive design  
   **Answer**: B
2. **152. What is the primary difference between mobile-first and desktop-first design approaches?**  
   A. The initial target audience  
   B. The order of CSS media queries  
   C. The programming language used  
   D. The hosting platform requirements  
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3. **153. What is the purpose of a viewport meta tag?**  
   A. To define the responsive behavior of a webpage  
   B. To specify the character encoding  
   C. To establish connection protocols  
   D. To structure HTML tables  
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4. **154. Which of the following frameworks is optimized for cross-platform design?**  
   A. React.js  
   B. Bootstrap  
   C. Django  
   D. Laravel  
   **Answer**: B
5. **155. Which technology helps ensure a consistent user experience across browsers?**  
   A. Polyfills  
   B. REST APIs  
   C. CORS  
   D. JSON  
   **Answer**: A

**JavaScript Basics: Advanced DOM and Asynchronous Programming**

1. **201. What is the difference between querySelector and getElementById?**  
   A. querySelector allows CSS-style selectors; getElementById only targets elements by ID  
   B. Both are used for the same purpose  
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**Web Protocols: REST APIs, WebSockets, and Security**

1. **251. What does REST stand for in REST API?**  
   A. Representational State Transfer  
   B. Recursive Secure Transfer  
   C. Repeated Structured Transactions  
   D. Real-time Event Stream  
   **Answer**: A
2. **252. What is the primary benefit of using HTTPS over HTTP?**  
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3. **253. Which HTTP status code indicates a successful request?**  
   A. 404  
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**Distribution of New Questions:**

**HTML/CSS (Advanced)**: 50

**Static vs Dynamic Websites (Advanced)**: 50

**Hosting (Cloud/Advanced Services)**: 50

**Cross-Platform Design (PWAs)**: 50

**JavaScript Basics (Advanced Concepts)**: 50

**Web Protocols (Security/REST APIs)**: 50

**Cybersecurity**

● Fundamentals: Types of malware (virus, ransomware, Trojan), phishing, DDoS attacks.

● Encryption: Basics of symmetric and asymmetric encryption (AES, RSA).

● Firewalls: Types and configurations.

● Blockchain: Basic concepts and applications.

**Fundamentals: Types of Malware, Phishing, DDoS Attacks**

1. **Which of the following is NOT a type of malware?**  
   A. Ransomware  
   B. Adware  
   C. Phishing  
   D. Trojan  
   **Answer**: C
2. **What is the primary goal of ransomware?**  
   A. To steal personal information  
   B. To encrypt files and demand payment for decryption  
   C. To spy on the user’s activity  
   D. To overload the server with traffic  
   **Answer**: B
3. **A Trojan horse is a type of malware that:**  
   A. Replicates itself and spreads to other devices  
   B. Pretends to be legitimate software to trick users  
   C. Encrypts files on the system  
   D. Floods a network with traffic  
   **Answer**: B
4. **What does DDoS stand for?**  
   A. Distributed Denial of Service  
   B. Dedicated Denial of Service  
   C. Data Distribution over System  
   D. Direct Denial of Server  
   **Answer**: A
5. **Which of the following best describes phishing?**  
   A. Sending deceptive emails to trick users into revealing sensitive information  
   B. Infecting systems with ransomware  
   C. Encrypting traffic over a network  
   D. Hacking into secure servers  
   **Answer**: A

**Encryption: Basics of Symmetric and Asymmetric Encryption (AES, RSA)**

1. **51. Which of the following is a symmetric encryption algorithm?**  
   A. RSA  
   B. AES  
   C. DSA  
   D. ECC  
   **Answer**: B
2. **What key size is commonly used in RSA encryption?**  
   A. 56 bits  
   B. 128 bits  
   C. 2048 bits  
   D. 64 bits  
   **Answer**: C
3. **Symmetric encryption uses:**  
   A. One key for both encryption and decryption  
   B. A pair of keys: one for encryption, one for decryption  
   C. Public keys only  
   D. Private keys only  
   **Answer**: A
4. **Which of the following is a major advantage of asymmetric encryption over symmetric encryption?**  
   A. It is faster than symmetric encryption  
   B. It requires only one key  
   C. It enables secure communication without pre-sharing keys  
   D. It works offline  
   **Answer**: C
5. **AES stands for:**  
   A. Advanced Encryption System  
   B. Advanced Encryption Standard  
   C. Asymmetric Encryption Standard  
   D. Algorithmic Encryption System  
   **Answer**: B

**Firewalls: Types and Configurations**

1. **What is the primary purpose of a firewall?**  
   A. To prevent unauthorized access to or from a private network  
   B. To encrypt data during transmission  
   C. To monitor user activity  
   D. To manage databases  
   **Answer**: A
2. **Which type of firewall filters traffic based on IP addresses and port numbers?**  
   A. Packet-filtering firewall  
   B. Proxy firewall  
   C. Stateful inspection firewall  
   D. Application-layer firewall  
   **Answer**: A
3. **A proxy firewall operates at which layer of the OSI model?**  
   A. Network layer  
   B. Application layer  
   C. Data link layer  
   D. Physical layer  
   **Answer**: B
4. **What is a key characteristic of a stateful inspection firewall?**  
   A. It analyzes traffic based only on headers  
   B. It tracks the state of active connections  
   C. It operates without maintaining a connection state  
   D. It encrypts incoming traffic  
   **Answer**: B
5. **Which of the following is NOT a function of a firewall?**  
   A. Blocking unauthorized access  
   B. Monitoring traffic logs  
   C. Encrypting all network traffic  
   D. Allowing access to certain applications  
   **Answer**: C

**Blockchain: Basic Concepts and Applications**

1. **151. What is blockchain?**  
   A. A distributed and immutable digital ledger  
   B. A method for compressing large files  
   C. A centralized database technology  
   D. A private-key encryption system  
   **Answer**: A
2. **152. The key feature of blockchain is:**  
   A. Centralized storage  
   B. Data immutability and transparency  
   C. Fast computation  
   D. High data compression rates  
   **Answer**: B
3. **153. Which of the following is the consensus mechanism used by Bitcoin?**  
   A. Proof of Stake (PoS)  
   B. Proof of Work (PoW)  
   C. Delegated Proof of Stake (DPoS)  
   D. Byzantine Fault Tolerance (BFT)  
   **Answer**: B
4. **154. Smart contracts are:**  
   A. Self-executing agreements with predefined rules coded into them  
   B. Contracts verified by third parties  
   C. Blockchain-based encryption tools  
   D. Methods for file sharing  
   **Answer**: A
5. **155. What does the term "mining" in blockchain refer to?**  
   A. Extracting valuable data from the blockchain  
   B. Solving complex mathematical problems to validate transactions  
   C. Storing encrypted files  
   D. Compressing blocks for faster transmission  
   **Answer**: B

**Extended Topics for Advanced Cybersecurity Understanding**

1. **Fundamentals**:
   1. Advanced questions on malware detection and prevention tools.
   2. Phishing techniques and social engineering strategies.
   3. Botnets and their role in DDoS attacks.
2. **Encryption**:
   1. Real-world scenarios involving hybrid encryption (combination of AES and RSA).
   2. Elliptic Curve Cryptography (ECC) and its advantages over RSA.
   3. Key management challenges in symmetric encryption.
3. **Firewalls**:
   1. Modern firewall technologies like NGFW (Next-Generation Firewalls).
   2. Intrusion detection/prevention systems (IDS/IPS).
   3. Firewalls in cloud environments (e.g., AWS, Azure).
4. **Blockchain**:
   1. Applications in sectors beyond cryptocurrency (e.g., supply chain, healthcare).
   2. Comparison of public vs. private blockchains.
   3. Role of blockchain in enhancing cybersecurity.

**Fundamentals: Advanced Malware, Phishing, DDoS Attacks**

1. **Which of the following is a characteristic of a polymorphic virus?**  
   A. It changes its code each time it spreads  
   B. It can encrypt files on the system  
   C. It replicates itself in multiple locations  
   D. It spreads through network vulnerabilities  
   **Answer**: A
2. **Which type of malware disguises itself as a legitimate program to deceive users?**  
   A. Worm  
   B. Trojan  
   C. Rootkit  
   D. Adware  
   **Answer**: B
3. **What is the primary aim of a Distributed Denial of Service (DDoS) attack?**  
   A. To access confidential data  
   B. To overload a network or server with traffic  
   C. To exploit a system vulnerability  
   D. To install a keylogger  
   **Answer**: B
4. **What is a key characteristic of a botnet used in DDoS attacks?**  
   A. It is a network of infected devices controlled remotely  
   B. It encrypts data to avoid detection  
   C. It is a legitimate software tool  
   D. It is used for phishing attacks  
   **Answer**: A
5. **Which type of phishing attack involves deceptive phone calls?**  
   A. Vishing  
   B. Spear phishing  
   C. Whaling  
   D. Smishing  
   **Answer**: A

**Encryption: Advanced Symmetric and Asymmetric Techniques**

1. **51. Which encryption standard is considered secure for long-term data protection?**  
   A. DES  
   B. 3DES  
   C. AES  
   D. RSA  
   **Answer**: C
2. **52. Which of the following is NOT an advantage of symmetric encryption?**  
   A. Faster than asymmetric encryption  
   B. Requires a single key for both encryption and decryption  
   C. Ideal for encrypting small amounts of data  
   D. It’s secure without needing to share the key beforehand  
   **Answer**: D
3. **53. Which type of encryption algorithm is most commonly used for securing web traffic?**  
   A. RSA  
   B. AES  
   C. SSL/TLS  
   D. DES  
   **Answer**: C
4. **54. What is the main difference between public-key cryptography and symmetric-key cryptography?**  
   A. Public-key cryptography uses a pair of keys, while symmetric-key uses one key  
   B. Public-key cryptography is faster than symmetric-key cryptography  
   C. Symmetric-key cryptography can only be used for short messages  
   D. Public-key cryptography is only used for encryption, not decryption  
   **Answer**: A
5. **55. In the RSA encryption algorithm, what are the two keys used for encryption and decryption called?**  
   A. Public and private keys  
   B. Shared and public keys  
   C. Private and symmetric keys  
   D. Public and symmetric keys  
   **Answer**: A

**Firewalls: Advanced Types, Network Configuration, and Security**

1. **101. What is the primary difference between a stateless and a stateful firewall?**  
   A. Stateless firewalls track connection states, while stateful do not  
   B. Stateless firewalls analyze each packet independently, while stateful firewalls track the state of active connections  
   C. Stateful firewalls only filter traffic at the application layer  
   D. Stateless firewalls provide more security than stateful firewalls  
   **Answer**: B
2. **102. What type of firewall filters traffic based on the content of the packets rather than just the header?**  
   A. Packet-filtering firewall  
   B. Proxy firewall  
   C. Application-layer firewall  
   D. Stateful inspection firewall  
   **Answer**: C
3. **103. What is the purpose of a DMZ (Demilitarized Zone) in network security?**  
   A. To hide sensitive internal data from external users  
   B. To provide additional network bandwidth  
   C. To isolate and protect web servers from direct access to the internal network  
   D. To monitor internal network traffic  
   **Answer**: C
4. **104. A Next-Generation Firewall (NGFW) is capable of:**  
   A. Only blocking incoming malicious traffic  
   B. Deep packet inspection and intrusion prevention  
   C. Monitoring web traffic only  
   D. Encrypting all incoming traffic  
   **Answer**: B
5. **105. Which of the following is a key feature of a proxy firewall?**  
   A. It provides transparent communication for end users  
   B. It hides the internal network behind a proxy server  
   C. It uses a packet filtering approach to traffic analysis  
   D. It prevents all incoming connections  
   **Answer**: B

**Blockchain: Advanced Concepts, Security, and Use Cases**

1. **151. Which of the following is a consensus algorithm used in blockchain for validating transactions?**  
   A. Proof of Stake (PoS)  
   B. Proof of Work (PoW)  
   C. Delegated Proof of Stake (DPoS)  
   D. All of the above  
   **Answer**: D
2. **152. What is the primary benefit of using blockchain for financial transactions?**  
   A. Increased transaction speed  
   B. No need for third-party verification  
   C. Lower encryption costs  
   D. It allows for central control over transactions  
   **Answer**: B
3. **153. In a blockchain network, a node is:**  
   A. A block of encrypted data  
   B. A participant or entity that validates and records transactions  
   C. The blockchain protocol for hashing  
   D. A smart contract executed on the network  
   **Answer**: B
4. **154. Which type of blockchain is typically used for private, permissioned networks?**  
   A. Public blockchain  
   B. Private blockchain  
   C. Hybrid blockchain  
   D. Sidechain  
   **Answer**: B
5. **155. What is the role of a "block" in a blockchain?**  
   A. It holds a collection of data, including transactions and a timestamp  
   B. It is the key to encrypting data in the system  
   C. It monitors the status of nodes in the network  
   D. It stores personal information about users  
   **Answer**: A

**Extended Topics for Cybersecurity Specialization**

1. **Malware Analysis**:
   1. Understanding rootkits, spyware, and advanced persistent threats (APTs).
   2. Malware sandboxing and reverse engineering techniques.
2. **Advanced Encryption**:
   1. Exploring elliptic curve cryptography (ECC) and its use in mobile devices.
   2. Quantum cryptography and its potential impact on current encryption standards.
3. **Advanced Firewall Configuration**:
   1. Implementing Intrusion Detection and Prevention Systems (IDS/IPS).
   2. Firewall rule optimization and preventing unauthorized access.
4. **Blockchain Security**:
   1. Security vulnerabilities in smart contracts and decentralized applications (dApps).
   2. Analysis of blockchain forks, consensus failures, and network attacks.

**Advanced Malware Analysis: Rootkits, APTs, and Detection Techniques**

1. **What is a rootkit?**  
   A. A virus that replicates itself to infect files  
   B. A tool designed to conceal the presence of malicious software  
   C. A type of spyware used for tracking user activity  
   D. A legitimate software program used to manage system settings  
   **Answer**: B
2. **Which of the following is the primary purpose of an Advanced Persistent Threat (APT)?**  
   A. To encrypt files and demand a ransom  
   B. To steal sensitive data over an extended period without detection  
   C. To flood a network with traffic  
   D. To disrupt system operations temporarily  
   **Answer**: B
3. **A key feature of a rootkit is that it:**  
   A. Replicates itself to spread across a network  
   B. Alters system files to hide malicious activities  
   C. Encrypts user data for ransom  
   D. Uses social engineering tactics to trick users  
   **Answer**: B
4. **Which of the following is a method for detecting rootkits on a system?**  
   A. Regular system reboots  
   B. Signature-based detection  
   C. Behavioral analysis  
   D. Data encryption  
   **Answer**: C
5. **The primary risk posed by an APT is:**  
   A. Loss of data integrity due to encryption  
   B. Temporary disruption of services  
   C. Long-term, undetected data theft  
   D. Disruption of network traffic  
   **Answer**: C

**Advanced Encryption: Quantum Cryptography and Key Exchange Algorithms**

1. **51. What is the key advantage of Quantum Key Distribution (QKD)?**  
   A. It increases data compression efficiency  
   B. It provides an unbreakable encryption key exchange  
   C. It reduces the computational load of encryption  
   D. It enables faster data transmission  
   **Answer**: B
2. **52. Which of the following algorithms is considered resistant to attacks by quantum computers?**  
   A. RSA  
   B. AES  
   C. SHA-256  
   D. Lattice-based encryption  
   **Answer**: D
3. **53. What is the primary challenge with quantum encryption for the future of cybersecurity?**  
   A. Its high computational cost  
   B. The requirement for completely new encryption protocols  
   C. The need for physical infrastructure changes  
   D. Its reliance on public key systems  
   **Answer**: B
4. **54. Which of the following describes a benefit of Elliptic Curve Cryptography (ECC) over RSA?**  
   A. ECC is faster and uses smaller key sizes for equivalent security levels  
   B. ECC is easier to implement  
   C. ECC supports more algorithms than RSA  
   D. ECC has been proven more resistant to quantum attacks  
   **Answer**: A
5. **55. In asymmetric encryption, what is typically used to verify the integrity of a message?**  
   A. Digital signature  
   B. Symmetric key  
   C. Hash function  
   D. Cipher block chaining  
   **Answer**: A

**Firewall Configuration: Advanced Types and Intrusion Detection Systems**

1. **101. What is the main function of an Intrusion Detection System (IDS)?**  
   A. To prevent unauthorized users from accessing a network  
   B. To analyze traffic and identify potential threats  
   C. To encrypt sensitive data in transit  
   D. To act as a backup for firewall configurations  
   **Answer**: B
2. **102. Which of the following is a key difference between a traditional firewall and a Next-Generation Firewall (NGFW)?**  
   A. NGFWs perform deeper packet inspection and integrate intrusion prevention  
   B. Traditional firewalls filter based only on IP addresses, while NGFWs use AI to analyze traffic  
   C. NGFWs are used only in cloud networks, whereas traditional firewalls are for on-premise security  
   D. Traditional firewalls can block certain types of malware, while NGFWs cannot  
   **Answer**: A
3. **103. What does "deep packet inspection" in a firewall involve?**  
   A. Checking the packet's destination address  
   B. Inspecting the content of the packet for malicious code or data  
   C. Analyzing traffic patterns to detect unusual behavior  
   D. Filtering traffic based on packet headers only  
   **Answer**: B
4. **104. A “stateful firewall” performs which of the following?**  
   A. It monitors the entire state of a system, including user activity  
   B. It tracks active connections and evaluates the state of network traffic  
   C. It only blocks traffic from external sources  
   D. It uses machine learning to adapt to new types of attacks  
   **Answer**: B
5. **105. What type of firewall is most effective at securing web applications?**  
   A. Packet-filtering firewall  
   B. Proxy firewall  
   C. Web Application Firewall (WAF)  
   D. Stateful inspection firewall  
   **Answer**: C

**Blockchain Security: Attacks, Smart Contracts, and Network Integrity**

1. **151. A 51% attack on a blockchain network refers to:**  
   A. A scenario where an attacker controls 51% or more of the blockchain's mining power  
   B. An attack that targets 51% of a network’s nodes for denial of service  
   C. A scenario where a blockchain is split into 51% public and 49% private chains  
   D. An attack where an attacker gains access to 51% of encrypted transaction data  
   **Answer**: A
2. **152. In blockchain, what is the purpose of a "hash" function?**  
   A. To encrypt sensitive data  
   B. To link blocks together securely  
   C. To distribute computational work evenly across the network  
   D. To verify the identity of the sender  
   **Answer**: B
3. **153. Smart contracts are self-executing scripts that:**  
   A. Need a third-party authority to enforce  
   B. Automatically enforce contractual obligations based on predefined conditions  
   C. Require manual intervention for every transaction  
   D. Only work on centralized networks  
   **Answer**: B
4. **154. What is a common vulnerability in smart contracts?**  
   A. Weak encryption algorithms  
   B. Inability to handle complex logic  
   C. Insufficient auditing before deployment  
   D. Limited scalability  
   **Answer**: C
5. **155. Which of the following is a method of ensuring the integrity of a blockchain network?**  
   A. Regularly resetting all transaction logs  
   B. Using Proof of Work or Proof of Stake consensus mechanisms  
   C. Centralized control by a single entity  
   D. Reducing the block size to increase transaction speed  
   **Answer**: B

**Software Engineering**

● Development Models: SDLC, Waterfall, Agile, DevOps basics.

● Version Control: Git basics, commands, and workflow.

● Testing: Unit testing, integration testing, white-box testing, black-box testing.

### ****Development Models: SDLC, Waterfall, Agile, DevOps Basics****

1. **The Waterfall Model is best suited for which of the following projects?**  
   A. Projects with unclear requirements  
   B. Projects where changes are expected frequently  
   C. Projects with clear, well-defined requirements  
   D. Projects requiring continuous delivery  
   **Answer**: C
2. **What is the primary disadvantage of the Waterfall model?**  
   A. It lacks flexibility for changes during the development process  
   B. It is too fast for large projects  
   C. It does not involve end-user feedback  
   D. It encourages too much planning  
   **Answer**: A
3. **Which of the following is a key principle of the Agile methodology?**  
   A. Extensive documentation  
   B. Iterative and incremental development  
   C. Strict adherence to predefined processes  
   D. Linear development with no changes after planning  
   **Answer**: B
4. **In Agile development, what is a “sprint”?**  
   A. A phase of the software development lifecycle  
   B. A short, time-boxed iteration of work  
   C. A document that tracks software requirements  
   D. A review meeting with stakeholders  
   **Answer**: B
5. **What is the primary goal of DevOps in software development?**  
   A. To delay product releases  
   B. To increase collaboration between development and operations teams  
   C. To create complex deployment processes  
   D. To eliminate testing in the development cycle  
   **Answer**: B
6. **In the SDLC, which phase involves defining the software's purpose and objectives?**  
   A. Design  
   B. Requirements gathering  
   C. Testing  
   D. Deployment  
   **Answer**: B
7. **Which of the following best describes the "Scrum" framework in Agile?**  
   A. A methodology focusing on daily stand-ups and long planning cycles  
   B. A formal process with a structured set of roles, events, and artifacts  
   C. A variant of Waterfall model adapted for rapid prototyping  
   D. A software development methodology with no defined roles  
   **Answer**: B
8. **Which of the following is a major benefit of the Agile model over the Waterfall model?**  
   A. Greater emphasis on documentation  
   B. Flexibility to accommodate changes throughout the development process  
   C. More efficient testing processes  
   D. Faster development with less planning  
   **Answer**: B
9. **In DevOps, Continuous Integration (CI) refers to:**  
   A. Testing and reviewing code continuously  
   B. Integrating software applications on a continuous basis  
   C. Continuous deployment of completed code into production  
   D. Continually analyzing customer feedback  
   **Answer**: B
10. **Which of the following is NOT a part of the Waterfall model?**  
    A. Requirements gathering  
    B. Design  
    C. Development  
    D. Continuous feedback and iterations  
    **Answer**: D

### ****Version Control: Git Basics, Commands, and Workflow****

1. **101. What does Git allow you to do?**  
   A. Create and manage branches for software versioning  
   B. Edit source code directly in the repository  
   C. Automatically fix coding bugs  
   D. Track only final versions of software  
   **Answer**: A
2. **102. Which of the following Git commands is used to stage changes for a commit?**  
   A. git push  
   B. git commit  
   C. git add  
   D. git pull  
   **Answer**: C
3. **103. What does the Git command git clone do?**  
   A. It copies the content of the working directory to the remote repository  
   B. It creates a new branch in the current repository  
   C. It copies a remote repository to your local machine  
   D. It updates the repository with new changes  
   **Answer**: C
4. **104. Which of the following commands will show the current state of your repository?**  
   A. git log  
   B. git status  
   C. git branch  
   D. git commit  
   **Answer**: B
5. **105. How do you create a new branch in Git?**  
   A. git start new-branch  
   B. git create branch new-branch  
   C. git branch new-branch  
   D. git checkout -b new-branch  
   **Answer**: C
6. **106. In Git, what does the git merge command do?**  
   A. Combines two branches together  
   B. Fetches updates from a remote repository  
   C. Reverts changes in the current branch  
   D. Deletes a branch after it has been merged  
   **Answer**: A
7. **107. What does the git push command do?**  
   A. Pushes changes from your local repository to the remote repository  
   B. Merges changes from a remote repository into the local repository  
   C. Creates a new repository  
   D. Clones a remote repository to your local machine  
   **Answer**: A
8. **108. What is the purpose of a Git commit message?**  
   A. To describe the specific changes made in the commit  
   B. To show the commit’s timestamp  
   C. To record the author of the commit  
   D. To specify the branch the commit belongs to  
   **Answer**: A
9. **109. Which of the following is the command used to see a list of all branches in a Git repository?**  
   A. git branch  
   B. git status  
   C. git list-branches  
   D. git show-branches  
   **Answer**: A
10. **110. What is the difference between git pull and git fetch?**  
    A. git pull updates the local repository with changes from the remote repository, while git fetch only downloads updates without merging  
    B. git pull deletes the local repository, and git fetch updates it  
    C. git pull commits changes to the repository, while git fetch does not  
    D. There is no difference between the two commands  
    **Answer**: A

### ****Testing: Unit Testing, Integration Testing, White-box, Black-box Testing****

1. **151. What is the primary goal of unit testing?**  
   A. To test individual components of a system in isolation  
   B. To verify the system meets the client's requirements  
   C. To test the entire system as a whole  
   D. To check the usability of the system  
   **Answer**: A
2. **152. Which testing technique focuses on evaluating the functionality of the system based on its inputs and outputs?**  
   A. White-box testing  
   B. Black-box testing  
   C. Regression testing  
   D. Unit testing  
   **Answer**: B
3. **153. In white-box testing, the tester is primarily concerned with:**  
   A. The behavior of the system based on user input  
   B. The internal logic and structure of the code  
   C. The performance of the system  
   D. The user interface design  
   **Answer**: B
4. **154. Integration testing focuses on:**  
   A. Testing individual units or functions of the system  
   B. Testing the system's interaction with external components or systems  
   C. Verifying the system meets customer requirements  
   D. Identifying system usability issues  
   **Answer**: B
5. **155. Which of the following is NOT a benefit of unit testing?**  
   A. Identifies bugs early in the development process  
   B. Ensures that individual components function as expected  
   C. Verifies the integration of the entire system  
   D. Helps in code refactoring and maintenance  
   **Answer**: C
6. **156. What is the primary objective of black-box testing?**  
   A. To test the internal workings of an application  
   B. To ensure the application’s code is optimized  
   C. To verify that the application works according to the user’s specifications  
   D. To improve code coverage during testing  
   **Answer**: C
7. **157. In which type of testing are test cases designed based on the system’s internal code structure?**  
   A. Black-box testing  
   B. Regression testing  
   C. White-box testing  
   D. Acceptance testing  
   **Answer**: C
8. **158. Regression testing is used to:**  
   A. Ensure that new changes or fixes do not break existing functionality  
   B. Test the system from an external user's perspective  
   C. Verify the system’s compatibility with different environments  
   D. Validate the final product meets user expectations  
   **Answer**: A
9. **159. What is the main purpose of acceptance testing?**  
   A. To verify that the system meets the business requirements  
   B. To test the system for performance bottlenecks  
   C. To evaluate the system's internal logic  
   D. To check the security vulnerabilities of the system  
   **Answer**: A
10. **160. Which of the following is an example of black-box testing?**  
    A. Testing the functionality of an online store by placing orders without knowing the source code  
    B. Testing the code behind the login form of an application  
    C. Reviewing the database queries used in a system  
    D. Checking the system’s internal error handling logic  
    **Answer**: A

### ****Development Models: SDLC, Waterfall, Agile, DevOps Basics (Continued)****

1. **Which of the following is an advantage of the Agile methodology?**  
   A. It provides a rigid structure that prevents changes  
   B. It focuses on flexibility and responding to change  
   C. It requires less interaction with the client  
   D. It minimizes testing during the development process  
   **Answer**: B
2. **In the Waterfall model, what happens after the design phase?**  
   A. Iterations occur to fix any issues  
   B. The project is evaluated for feasibility  
   C. Development starts after the design is approved  
   D. Testing is done before development starts  
   **Answer**: C
3. **Which of the following is a key component of the DevOps approach?**  
   A. Limited interaction between developers and operations  
   B. Continuous Integration (CI) and Continuous Delivery (CD)  
   C. Strict separation of development and operations teams  
   D. Emphasis on project documentation  
   **Answer**: B
4. **Which phase of the SDLC includes gathering requirements from the client?**  
   A. Design  
   B. Requirements gathering  
   C. Implementation  
   D. Testing  
   **Answer**: B
5. **What is the role of a Scrum Master in an Agile development process?**  
   A. To design and code the application  
   B. To manage and prioritize the product backlog  
   C. To facilitate the Scrum process and remove obstacles for the team  
   D. To perform acceptance testing  
   **Answer**: C
6. **What is the primary purpose of the Daily Stand-Up in Scrum?**  
   A. To discuss the project’s budget  
   B. To identify and resolve roadblocks in the project  
   C. To demonstrate the completed functionality to stakeholders  
   D. To discuss the detailed design of the application  
   **Answer**: B
7. **In Agile, what does the term "user story" mean?**  
   A. A long-form document outlining the requirements  
   B. A small, discrete unit of functionality that delivers value to the user  
   C. A brief report of the project's progress  
   D. A description of the development process  
   **Answer**: B
8. **What is the focus of the "Test-Driven Development" (TDD) approach?**  
   A. Writing tests after the code is completed  
   B. Writing tests before coding to guide development  
   C. Testing the entire system at the end of the project  
   D. Designing the system without considering testing  
   **Answer**: B
9. **What is the main benefit of using Continuous Deployment (CD) in DevOps?**  
   A. Faster release of new features to production  
   B. Increased time spent on testing and bug fixing  
   C. Decreased development time for the entire system  
   D. Limiting the deployment of new code  
   **Answer**: A
10. **What is the main purpose of "User Acceptance Testing" (UAT) in Agile?**  
    A. To verify if the system meets the business needs and requirements  
    B. To ensure that no security flaws are present in the system  
    C. To evaluate the design and usability of the system  
    D. To test system functionality based on technical specifications  
    **Answer**: A

### ****Version Control: Git Basics, Commands, and Workflow (Continued)****

1. **111. In Git, what does the git reset command do?**  
   A. It removes a file from the staging area but keeps it in the working directory  
   B. It commits the current changes to the remote repository  
   C. It creates a new branch from the current commit  
   D. It removes a file from the repository entirely  
   **Answer**: A
2. **112. When using Git, what does the git rebase command do?**  
   A. It reverts changes in the repository  
   B. It merges changes from one branch into another in a linear fashion  
   C. It deletes the current branch  
   D. It creates a backup of the repository  
   **Answer**: B
3. **113. What does the Git command git diff do?**  
   A. Shows the difference between the current working directory and the last commit  
   B. Shows the commit history for the current branch  
   C. Displays the file permissions of the repository  
   D. Lists all changes in the current repository  
   **Answer**: A
4. **114. In Git, what is a "fork"?**  
   A. A copy of a repository that allows you to make changes without affecting the original  
   B. A command used to merge two branches  
   C. A Git command that initializes a new repository  
   D. A special file format used in Git repositories  
   **Answer**: A
5. **115. What is a "merge conflict" in Git?**  
   A. When two or more developers make conflicting changes to the same part of a file  
   B. When the repository becomes corrupted  
   C. When a file is deleted accidentally  
   D. When a commit is pushed to the remote repository with errors  
   **Answer**: A
6. **116. Which of the following commands is used to create a new remote repository in Git?**  
   A. git remote add origin <url>  
   B. git init  
   C. git clone <url>  
   D. git create <repo-name>  
   **Answer**: A
7. **117. What is the purpose of .gitignore files in Git?**  
   A. To ignore any failed commits  
   B. To track ignored files and prevent them from being added to version control  
   C. To store Git commands for easy reuse  
   D. To list all the commits made in the repository  
   **Answer**: B
8. **118. What happens when you execute git pull?**  
   A. It stages all changes in your working directory  
   B. It fetches the latest changes from a remote repository and merges them with your local branch  
   C. It updates the files in the local repository without changing the current branch  
   D. It pushes your changes to the remote repository  
   **Answer**: B
9. **119. What does the Git command git stash do?**  
   A. It creates a backup of your local repository  
   B. It temporarily saves changes that are not yet committed  
   C. It archives a repository for later use  
   D. It deletes untracked files from your working directory  
   **Answer**: B
10. **120. In Git, what does the git log command display?**  
    A. The differences between two commits  
    B. A list of commits made in the current branch  
    C. The files that have been modified in the repository  
    D. The configuration settings for the Git repository  
    **Answer**: B

### ****Testing: Unit Testing, Integration Testing, White-box, Black-box Testing (Continued)****

1. **161. What is "Boundary Value Analysis" in testing?**  
   A. A technique for analyzing the internal structure of the code  
   B. A method of testing the boundaries of input values to identify defects  
   C. A strategy for testing the behavior of the user interface  
   D. A technique for testing performance under load  
   **Answer**: B
2. **162. Which of the following is an example of integration testing?**  
   A. Testing an individual function in isolation  
   B. Testing the system's interaction with an external API  
   C. Verifying the internal logic of an algorithm  
   D. Evaluating the user interface for ease of use  
   **Answer**: B
3. **163. What is the main purpose of white-box testing?**  
   A. To validate the system’s functionality without knowing the code structure  
   B. To analyze the internal logic and structure of the software  
   C. To ensure the system meets user requirements  
   D. To check the system's performance under heavy traffic  
   **Answer**: B
4. **164. What type of testing focuses on testing the entire system as a whole?**  
   A. Unit testing  
   B. Integration testing  
   C. System testing  
   D. Regression testing  
   **Answer**: C
5. **165. What is the difference between static and dynamic testing?**  
   A. Static testing involves executing the code, while dynamic testing does not  
   B. Static testing focuses on code analysis without executing the program  
   C. Static testing tests the system’s behavior, while dynamic testing evaluates its design  
   D. There is no difference between the two types of testing  
   **Answer**: B
6. **166. What is the goal of performance testing?**  
   A. To verify that the system meets all user requirements  
   B. To check the software’s functionality based on predefined test cases  
   C. To ensure the system works well under normal and peak loads  
   D. To validate the system’s security measures  
   **Answer**: C
7. **167. In the context of testing, what is "test coverage"?**  
   A. The percentage of test cases executed  
   B. The amount of code tested by the test cases  
   C. The number of defects found during testing  
   D. The number of tests that pass successfully  
   **Answer**: B
8. **168. In black-box testing, the focus is on:**  
   A. The internal structure of the system  
   B. The system’s interaction with users and external systems  
   C. The code quality and error handling  
   D. The system's security features  
   **Answer**: B
9. **169. What type of testing checks how an application behaves under stress?**  
   A. Load testing  
   B. Stress testing  
   C. Usability testing  
   D. Functional

### ****Development Models: SDLC, Waterfall, Agile, DevOps Basics****

1. **Which of the following is a key characteristic of the Agile Manifesto?**  
   A. Comprehensive documentation over working software  
   B. Following a set of predefined processes  
   C. Responding to change over following a plan  
   D. Emphasizing contract negotiation over customer collaboration  
   **Answer**: C
2. **Which SDLC model is known for its flexibility to accommodate changes during development?**  
   A. Waterfall  
   B. V-Model  
   C. Agile  
   D. Spiral  
   **Answer**: C
3. **What is a key disadvantage of the Waterfall model?**  
   A. It’s too flexible and allows for too many changes  
   B. It requires extensive documentation  
   C. It’s difficult to measure progress  
   D. It is expensive and time-consuming  
   **Answer**: B
4. **In Scrum, what is the purpose of a "Product Backlog"?**  
   A. To list all tasks completed in a sprint  
   B. To track defects and issues  
   C. To define all features, functions, and requirements for the product  
   D. To manage team resources and assignments  
   **Answer**: C
5. **What is the main benefit of DevOps?**  
   A. It focuses on increasing the quality of software through increased documentation  
   B. It improves collaboration and communication between development and operations teams  
   C. It decreases the speed of development by adding more checks and approvals  
   D. It reduces the need for testing in the development cycle  
   **Answer**: B
6. **What does the "Sprint Review" in Scrum focus on?**  
   A. Planning the next sprint  
   B. Demonstrating the work done to the stakeholders  
   C. Reviewing the code quality  
   D. Retrospective analysis of team performance  
   **Answer**: B
7. **What is the purpose of the "Retrospective" in Scrum?**  
   A. To review the product backlog  
   B. To evaluate the success of the sprint and improve processes  
   C. To test the system for bugs  
   D. To present new features to stakeholders  
   **Answer**: B

### ****Version Control: Git Basics, Commands, and Workflow****

1. **Which of the following commands is used to combine two branches in Git?**  
   A. git checkout  
   B. git merge  
   C. git rebase  
   D. git commit  
   **Answer**: B
2. **How do you undo the last commit in Git while keeping the changes?**  
   A. git reset --soft HEAD~1  
   B. git revert HEAD  
   C. git pull --rebase  
   D. git reset --hard HEAD~1  
   **Answer**: A
3. **What is the primary purpose of using git rebase over git merge?**  
   A. To remove files from the history  
   B. To merge changes without creating a merge commit  
   C. To reset a branch to its original state  
   D. To reapply commits on top of another base branch  
   **Answer**: B
4. **In Git, what does git push do?**  
   A. It pulls changes from the remote repository  
   B. It pushes the local commits to the remote repository  
   C. It stages changes for the next commit  
   D. It compares two branches  
   **Answer**: B
5. **What happens when you use git pull?**  
   A. It fetches changes from the remote repository but doesn’t merge them  
   B. It fetches and merges changes from the remote repository to your local branch  
   C. It commits all local changes automatically  
   D. It deletes the local branch  
   **Answer**: B
6. **What does git commit -m "message" do?**  
   A. Commits changes to the remote repository  
   B. Stages changes for commit  
   C. Creates a new branch with a message  
   D. Commits changes locally with a description message  
   **Answer**: D

### ****Testing: Unit Testing, Integration Testing, White-box, Black-box Testing****

1. **What is the primary purpose of unit testing?**  
   A. To verify that the individual units of code perform as expected  
   B. To check that the overall system performs under load  
   C. To ensure that the application is secure  
   D. To verify that the user interface is easy to use  
   **Answer**: A
2. **What is the purpose of integration testing?**  
   A. To test individual components of the system  
   B. To verify the interaction between different modules or components  
   C. To test the system’s performance  
   D. To test the system under different environmental conditions  
   **Answer**: B
3. **In black-box testing, which of the following is true?**  
   A. The tester has access to the internal code of the application  
   B. The tester focuses on the functionality and output of the application  
   C. The tester writes the code that is being tested  
   D. The tester tests only the source code without interacting with the system  
   **Answer**: B
4. **What is the primary goal of regression testing?**  
   A. To verify the system's functionality  
   B. To ensure that new changes do not break existing functionality  
   C. To test individual functions in isolation  
   D. To evaluate the performance of the system  
   **Answer**: B
5. **What does white-box testing primarily focus on?**  
   A. The external behavior of the system  
   B. The internal structure and logic of the code  
   C. The system's response to input values  
   D. The end-user experience  
   **Answer**: B
6. **Which of the following best describes exploratory testing?**  
   A. Testing based on predefined test cases  
   B. Testing without any planning or preparation  
   C. Testing while simultaneously learning about the system  
   D. Testing done after the software is deployed  
   **Answer**: C
7. **What is the purpose of stress testing?**  
   A. To check the usability of the application  
   B. To test the system's behavior under extreme load conditions  
   C. To validate the system’s security features  
   D. To ensure the system meets the business requirements  
   **Answer**: B
8. **What is boundary value analysis in testing?**  
   A. A technique that tests values at the boundaries of the input domain  
   B. A method for testing the performance of the system  
   C. A technique for testing the security of the system  
   D. A way of testing only the internal logic of the code  
   **Answer**: A
9. **Which of the following is an example of functional testing?**  
   A. Checking how the application behaves when subjected to high traffic  
   B. Verifying that a user can log in with valid credentials  
   C. Analyzing the internal code for vulnerabilities  
   D. Ensuring the system can recover from crashes  
   **Answer**: B

### ****Additional Important Questions in Software Engineering****

1. **What is "technical debt"?**  
   A. The amount of code a developer has written  
   B. The cost of maintaining poorly written code that needs frequent fixes  
   C. The number of bugs in the system  
   D. The development team's efficiency  
   **Answer**: B
2. **What does the term "minimum viable product" (MVP) refer to in Agile?**  
   A. The first fully functional product version  
   B. The simplest version of a product that is usable and provides value  
   C. A product that contains all features but is not tested  
   D. A product with a minimal user interface  
   **Answer**: B
3. **Which type of testing is primarily concerned with ensuring the application can function in various environments?**  
   A. Usability testing  
   B. Performance testing  
   C. Compatibility testing  
   D. Security testing  
   **Answer**: C
4. **What is the purpose of continuous integration (CI)?**  
   A. To continuously write new features into the codebase  
   B. To automatically integrate code into the main repository and test for issues  
   C. To ensure all developers work independently of each other  
   D. To limit changes to the codebase to avoid integration issues  
   **Answer**: B
5. **What is a "user story" in Agile?**  
   A. A detailed description of how to build the application  
   B. A short, informal description of a feature from the perspective of the user  
   C. A formal documentation of the application’s functionality  
   D. A report outlining the team’s progress  
   **Answer**: B
6. **What does the term "scope creep" refer to in project management?**  
   A. The expansion of the project's scope without proper authorization or planning  
   B. The gradual improvement of the project scope  
   C. Reducing the scope to ensure project completion on time  
   D. The reduction in the cost of project features  
   **Answer**: A
7. **What is the main advantage of automated testing over manual testing?**  
   A. It can replace all forms of manual testing  
   B. It allows for faster execution of tests and greater coverage  
   C. It guarantees fewer defects in the system  
   D. It is cheaper than manual testing  
   **Answer**: B

**Artificial Intelligence**

● AI Basics: Concepts of machine learning, neural networks.

● Applications: Natural Language Processing (NLP), computer vision.

● Algorithms: Supervised vs. unsupervised learning.

● Reinforcement Learning (RL): Key principles and applications.

### ****AI Basics: Concepts of Machine Learning, Neural Networks****

1. **What is the main goal of Artificial Intelligence (AI)?**  
   A. To simulate human intelligence  
   B. To create physical robots  
   C. To program complex algorithms  
   D. To improve machine hardware  
   **Answer**: A
2. **Which of the following is an example of machine learning?**  
   A. A robot that can perform complex tasks without human programming  
   B. A system that improves its performance on a task with experience  
   C. A computer that solves mathematical problems without human input  
   D. A computer performing calculations based on prewritten rules  
   **Answer**: B
3. **Which of the following describes supervised learning?**  
   A. Learning without labeled data  
   B. Learning from feedback after each action  
   C. Learning from labeled training data to predict output  
   D. Learning by exploring the environment without any pre-labeled data  
   **Answer**: C
4. **What is the key feature of unsupervised learning?**  
   A. It requires labeled data to train the model  
   B. It generates output based on user-defined rules  
   C. It learns patterns from unlabelled data  
   D. It relies on reinforcement signals to adjust its behavior  
   **Answer**: C
5. **What are neural networks primarily used for?**  
   A. To store large datasets  
   B. To simulate the behavior of the human brain in decision-making tasks  
   C. To perform high-speed calculations  
   D. To perform sorting algorithms  
   **Answer**: B
6. **Which component in a neural network is responsible for learning from data?**  
   A. Input layer  
   B. Output layer  
   C. Activation function  
   D. Hidden layers  
   **Answer**: D
7. **What is backpropagation in the context of neural networks?**  
   A. A method of correcting errors by adjusting weights based on the output  
   B. A technique for distributing the data across nodes  
   C. A way of adding noise to the network  
   D. A method for processing input data in the network  
   **Answer**: A
8. **Which activation function is commonly used in neural networks?**  
   A. Exponential function  
   B. ReLU (Rectified Linear Unit)  
   C. Logarithmic function  
   D. Polynomial function  
   **Answer**: B
9. **What does the term “training data” refer to in machine learning?**  
   A. Data used to evaluate the model’s performance  
   B. Data that has been processed and cleaned  
   C. Data used to adjust the weights in a neural network  
   D. Data used to feed the model to make predictions  
   **Answer**: C

### ****Applications: Natural Language Processing (NLP), Computer Vision****

1. **Which of the following tasks is commonly associated with Natural Language Processing (NLP)?**  
   A. Image recognition  
   B. Text classification and sentiment analysis  
   C. Game-playing strategies  
   D. Speech recognition in noisy environments  
   **Answer**: B
2. **What is a common application of Computer Vision?**  
   A. Analyzing and understanding human speech  
   B. Recognizing objects in digital images and videos  
   C. Optimizing machine learning models  
   D. Planning robotic movements in real-time  
   **Answer**: B
3. **Which of the following is an NLP technique used for text classification?**  
   A. Convolutional Neural Networks  
   B. K-Means Clustering  
   C. Support Vector Machines  
   D. Gradient Descent  
   **Answer**: C
4. **Which technique is commonly used for speech recognition in NLP?**  
   A. Hidden Markov Models  
   B. Naive Bayes Classifier  
   C. Decision Trees  
   D. Convolutional Neural Networks  
   **Answer**: A
5. **What does tokenization do in NLP?**  
   A. Breaks down sentences into individual words or tokens  
   B. Translates text into binary code  
   C. Assigns labels to parts of speech  
   D. Merges tokens into meaningful phrases  
   **Answer**: A
6. **Which algorithm is often used in NLP for sentiment analysis?**  
   A. K-Means Clustering  
   B. Recurrent Neural Networks (RNN)  
   C. Random Forest  
   D. Naive Bayes  
   **Answer**: D
7. **In computer vision, what is the task of object detection?**  
   A. Determining the brightness of an image  
   B. Identifying specific objects within an image and their locations  
   C. Changing the color palette of an image  
   D. Enhancing the resolution of an image  
   **Answer**: B
8. **Which of the following is used for feature extraction in computer vision?**  
   A. Histogram of Oriented Gradients (HOG)  
   B. Deep Q-Learning  
   C. K-Nearest Neighbors  
   D. Support Vector Machines  
   **Answer**: A
9. **What is the primary purpose of facial recognition in computer vision?**  
   A. Detecting whether an image contains a face  
   B. Identifying the emotional state of individuals  
   C. Matching a face to a specific person in a database  
   D. Enhancing the resolution of facial images  
   **Answer**: C
10. **Which machine learning model is widely used for image classification tasks?**  
    A. Convolutional Neural Networks (CNN)  
    B. Decision Trees  
    C. Linear Regression  
    D. K-Means Clustering  
    **Answer**: A

### ****Algorithms: Supervised vs. Unsupervised Learning****

1. **Which of the following is an example of a supervised learning algorithm?**  
   A. K-Means Clustering  
   B. Random Forest  
   C. Principal Component Analysis (PCA)  
   D. DBSCAN  
   **Answer**: B
2. **In unsupervised learning, the model is trained on which type of data?**  
   A. Labeled data  
   B. Unlabeled data  
   C. Reinforced data  
   D. Segmented data  
   **Answer**: B
3. **Which of the following is an unsupervised learning algorithm?**  
   A. Decision Trees  
   B. Support Vector Machines  
   C. K-Means Clustering  
   D. Linear Regression  
   **Answer**: C
4. **What is the key difference between supervised and unsupervised learning?**  
   A. Supervised learning uses unlabeled data, whereas unsupervised learning uses labeled data  
   B. Unsupervised learning focuses on prediction, while supervised learning focuses on finding hidden patterns  
   C. Supervised learning uses labeled data to make predictions, while unsupervised learning finds hidden structures in unlabeled data  
   D. There is no key difference between the two  
   **Answer**: C
5. **Which of the following algorithms is used in supervised learning for regression tasks?**  
   A. K-Means  
   B. Linear Regression  
   C. DBSCAN  
   D. Principal Component Analysis  
   **Answer**: B
6. **What is the primary goal of clustering in unsupervised learning?**  
   A. To predict future outcomes based on labeled data  
   B. To group data into clusters based on similarity  
   C. To minimize error during training  
   D. To classify input data into predefined categories  
   **Answer**: B
7. **Which of the following is true about K-Means clustering?**  
   A. It is a supervised learning algorithm  
   B. It works by minimizing the sum of squared distances between data points and cluster centroids  
   C. It uses labeled data to create clusters  
   D. It is an algorithm used for dimensionality reduction  
   **Answer**: B
8. **What is a decision tree primarily used for in supervised learning?**  
   A. To predict continuous values  
   B. To classify input data into categories  
   C. To reduce the dimensionality of input data  
   D. To cluster data into similar groups  
   **Answer**: B
9. **What is a common challenge in supervised learning?**  
   A. Difficulty in obtaining labeled data  
   B. Lack of data variety  
   C. Overfitting to the data  
   D. High variance in input data  
   **Answer**: A
10. **Which of the following algorithms is an example of an unsupervised learning technique for dimensionality reduction?**  
    A. K-Nearest Neighbors  
    B. Linear Regression  
    C. Principal Component Analysis (PCA)  
    D. Support Vector Machines  
    **Answer**: C

### ****Reinforcement Learning (RL): Key Principles and Applications****

1. **In reinforcement learning, what does an agent do?**  
   A. Learns by receiving feedback from the environment based on actions taken  
   B. Makes decisions based on prior knowledge  
   C. Uses a supervised model to make predictions  
   D. Analyzes labeled data to make classifications  
   **Answer**: A
2. **What is the reward signal in reinforcement learning?**  
   A. The feedback received after an agent’s action to indicate success or failure  
   B. The loss function used to optimize the agent’s behavior  
   C. The environment that the agent interacts with  
   D. The final output produced by the agent’s action  
   **Answer**: A
3. **What is the main objective of an agent in reinforcement learning?**  
   A. To maximize the cumulative reward over time  
   B. To minimize the amount of feedback required  
   C. To ensure all actions are successful  
   D. To classify actions into predefined categories  
   **Answer**: A
4. **Which algorithm is commonly used in reinforcement learning?**  
   A. Q-Learning  
   B. K

### ****Reinforcement Learning (RL): Key Principles and Applications (Continued)****

1. **In reinforcement learning, what does the term "policy" refer to?**  
   A. A method for evaluating the environment  
   B. A strategy that the agent uses to determine its actions  
   C. A rule that governs how rewards are assigned  
   D. The loss function used to train the agent  
   **Answer**: B
2. **What is the "exploration vs. exploitation" dilemma in reinforcement learning?**  
   A. Deciding whether to use random actions or follow the best-known strategy  
   B. Deciding whether to increase the reward or decrease the penalty  
   C. Deciding between supervised learning and unsupervised learning  
   D. Deciding whether to increase training data or decrease model complexity  
   **Answer**: A
3. **In Q-Learning, what does the Q-value represent?**  
   A. The probability of an action leading to a successful outcome  
   B. The value of the agent’s policy  
   C. The cumulative reward for a given state-action pair  
   D. The potential future reward after taking an action  
   **Answer**: C
4. **What is the primary objective of the Bellman equation in reinforcement learning?**  
   A. To optimize the reward function  
   B. To compute the value of each state in the environment  
   C. To predict the future actions of the agent  
   D. To determine the agent’s exploration strategy  
   **Answer**: B
5. **Which type of algorithm is commonly used for policy optimization in reinforcement learning?**  
   A. Gradient Descent  
   B. Temporal Difference (TD) Learning  
   C. Support Vector Machines  
   D. K-Means Clustering  
   **Answer**: B
6. **What is a major challenge in reinforcement learning?**  
   A. Lack of labeled data  
   B. Difficulty in computing the total reward  
   C. The high computational cost due to real-time decision-making  
   D. Low performance of neural networks in dynamic environments  
   **Answer**: C
7. **What is the concept of “reward shaping” in reinforcement learning?**  
   A. Changing the environment to maximize rewards  
   B. Modifying the reward function to make learning more efficient  
   C. Assigning higher rewards to more dangerous actions  
   D. Using pre-trained models to guide the agent's actions  
   **Answer**: B
8. **In the context of reinforcement learning, what is the “discount factor” used for?**  
   A. To penalize the agent for taking poor actions  
   B. To reduce the impact of future rewards on the agent’s decisions  
   C. To increase the reward for long-term success  
   D. To ensure rewards remain constant over time  
   **Answer**: B
9. **Which of the following is a key advantage of deep reinforcement learning?**  
   A. It requires no training data  
   B. It allows the agent to learn from raw sensory input (like images)  
   C. It does not need an environment to simulate actions  
   D. It is easier to implement than traditional reinforcement learning  
   **Answer**: B
10. **What is "model-based reinforcement learning"?**  
    A. An approach where the agent learns the dynamics of the environment and plans actions accordingly  
    B. A method where the agent is not provided with feedback  
    C. A technique that uses neural networks to predict outcomes  
    D. An algorithm that always takes the most rewarding actions without learning  
    **Answer**: A
11. **What is the primary difference between on-policy and off-policy learning in RL?**  
    A. On-policy learning uses the same policy for both training and evaluation, while off-policy learning uses a different policy for training.  
    B. On-policy learning only works for unsupervised tasks, while off-policy learning works for supervised tasks.  
    C. On-policy learning requires feedback, whereas off-policy learning does not.  
    D. On-policy learning is faster to converge than off-policy learning.  
    **Answer**: A

### ****AI Algorithms and Techniques****

1. **Which algorithm is often used to reduce dimensionality in large datasets?**  
   A. K-Means  
   B. Principal Component Analysis (PCA)  
   C. Linear Regression  
   D. Support Vector Machines  
   **Answer**: B
2. **Which of the following is an application of reinforcement learning in real-world scenarios?**  
   A. Autonomous vehicles navigating roads  
   B. Identifying fraudulent transactions  
   C. Sentiment analysis of text data  
   D. Classifying images of animals  
   **Answer**: A
3. **In the context of machine learning, what is a hyperparameter?**  
   A. A parameter that is learned from the data  
   B. A fixed parameter that controls the learning process  
   C. A parameter representing the output of a model  
   D. A parameter that directly influences the cost function  
   **Answer**: B
4. **Which algorithm is typically used for supervised learning with a large number of features?**  
   A. K-Means Clustering  
   B. Decision Trees  
   C. Support Vector Machines  
   D. Naive Bayes  
   **Answer**: C
5. **What is the purpose of the activation function in neural networks?**  
   A. To provide feedback about the loss during training  
   B. To convert the weighted sum of inputs into an output for each neuron  
   C. To optimize the weights during training  
   D. To evaluate the model's accuracy  
   **Answer**: B
6. **In supervised learning, what does overfitting refer to?**  
   A. The model performs poorly on both training and testing data  
   B. The model is too simple to capture underlying patterns  
   C. The model learns the training data too well and performs poorly on unseen data  
   D. The model fails to converge during training  
   **Answer**: C
7. **What is a confusion matrix used for?**  
   A. To measure the computational efficiency of the model  
   B. To visualize and evaluate the performance of a classification model  
   C. To calculate the regression error  
   D. To validate the performance of clustering algorithms  
   **Answer**: B
8. **Which of the following is a key component of a convolutional neural network (CNN)?**  
   A. Fully connected layers  
   B. Recurrent connections  
   C. Convolutional layers  
   D. Pooling layers  
   **Answer**: C
9. **In the context of neural networks, what is dropout used for?**  
   A. To prevent the model from overfitting by randomly deactivating some neurons during training  
   B. To increase the learning rate  
   C. To simplify the training process  
   D. To remove irrelevant features from the data  
   **Answer**: A
10. **Which of the following is a key advantage of using deep learning models?**  
    A. They require less data than traditional machine learning models  
    B. They are easier to interpret and understand  
    C. They can automatically extract features from raw data like images and text  
    D. They are faster to train than traditional models  
    **Answer**: C
11. **What does "gradient descent" refer to in machine learning?**  
    A. A method to find the optimal weights in a model by iteratively adjusting them in the direction of the steepest decrease in error  
    B. A technique used to speed up the training process  
    C. A method for splitting data into training and testing sets  
    D. A way to visualize the decision boundaries of a model  
    **Answer**: A
12. **What is the main advantage of the k-Nearest Neighbors (K-NN) algorithm?**  
    A. It is fast and requires no training data  
    B. It is effective for both classification and regression tasks  
    C. It is resistant to overfitting  
    D. It works well for high-dimensional datasets  
    **Answer**: B
13. **What does the term "ensemble learning" refer to?**  
    A. Using a single learning algorithm to achieve high accuracy  
    B. Combining multiple models to improve performance and accuracy  
    C. Learning from multiple datasets at once  
    D. Training a model with a single, large dataset  
    **Answer**: B

### ****Reinforcement Learning Applications****

1. **In which of the following tasks is reinforcement learning NOT commonly applied?**  
   A. Video game AI  
   B. Robotic control  
   C. Stock market prediction  
   D. Spam email classification  
   **Answer**: D
2. **What is the concept of “delayed reward” in reinforcement learning?**  
   A. The agent receives a reward immediately after taking an action  
   B. The reward is delayed and depends on a series of actions taken over time  
   C. The agent receives no reward at all  
   D. Rewards are given after the entire task is completed  
   **Answer**: B
3. **In the context of RL, what is the role of the "environment"?**  
   A. To adjust the model's weights during training  
   B. To provide rewards based on the agent's actions  
   C. To monitor the performance of the agent  
   D. To classify data based on the agent’s learning  
   **Answer**: B

### ****AI Fundamentals****

1. **Which of the following is not an example of Artificial Intelligence?**  
   A. Voice assistants like Siri  
   B. Autonomous driving systems  
   C. Video encoding algorithms  
   D. AI-based medical diagnosis systems  
   **Answer**: C
2. **Which type of machine learning algorithm is commonly used for tasks such as image recognition?**  
   A. Linear Regression  
   B. Convolutional Neural Networks (CNN)  
   C. K-Means Clustering  
   D. Principal Component Analysis (PCA)  
   **Answer**: B
3. **In machine learning, what does "bias" refer to?**  
   A. The variance in the model's predictions  
   B. A term that adjusts the output of a neuron in a neural network  
   C. The error caused by the model not fitting the data well  
   D. The generalization ability of the model  
   **Answer**: B
4. **Which algorithm is primarily used for classification tasks in machine learning?**  
   A. Linear Regression  
   B. K-Nearest Neighbors (K-NN)  
   C. K-Means Clustering  
   D. Support Vector Machines (SVM)  
   **Answer**: D
5. **What is the main advantage of Random Forest over a decision tree?**  
   A. It is simpler to understand  
   B. It is less prone to overfitting  
   C. It requires less training data  
   D. It performs better on regression tasks  
   **Answer**: B

### ****Reinforcement Learning (RL)****

1. **In Q-Learning, which of the following parameters is used to update the Q-values?**  
   A. Learning rate  
   B. Reward  
   C. Discount factor  
   D. All of the above  
   **Answer**: D
2. **Which of the following best describes the exploration strategy in reinforcement learning?**  
   A. Always take the action that leads to the highest reward  
   B. Take random actions to discover potentially better strategies  
   C. Always repeat the previous actions to maximize reward  
   D. Follow the pre-trained model without changing actions  
   **Answer**: B
3. **In reinforcement learning, what is the "value function" used for?**  
   A. To decide the best actions the agent can take  
   B. To evaluate the quality of a state based on future rewards  
   C. To store the history of the agent's actions  
   D. To randomly assign rewards to states  
   **Answer**: B
4. **In deep reinforcement learning, which algorithm combines deep learning with reinforcement learning?**  
   A. Deep Q-Network (DQN)  
   B. Generative Adversarial Network (GAN)  
   C. Long Short-Term Memory (LSTM)  
   D. K-Means  
   **Answer**: A
5. **What is the difference between model-free and model-based reinforcement learning?**  
   A. Model-free RL learns from interaction, while model-based RL uses a model of the environment  
   B. Model-free RL requires no feedback, while model-based RL uses a model to guide actions  
   C. Model-free RL uses simpler algorithms, while model-based RL uses deep learning  
   D. Model-free RL is only for unsupervised tasks, while model-based RL is for supervised tasks  
   **Answer**: A

### ****Supervised vs. Unsupervised Learning****

1. **In supervised learning, what is the primary goal?**  
   A. To reduce dimensionality  
   B. To cluster data into groups  
   C. To learn a mapping from input to output using labeled data  
   D. To classify data without any labeled examples  
   **Answer**: C
2. **Which of the following is a common example of an unsupervised learning task?**  
   A. Spam email detection  
   B. Image classification  
   C. Market basket analysis  
   D. Stock market prediction  
   **Answer**: C
3. **Which of the following algorithms is typically used for dimensionality reduction?**  
   A. K-Means Clustering  
   B. Principal Component Analysis (PCA)  
   C. Naive Bayes  
   D. Support Vector Machine  
   **Answer**: B
4. **What is the main difference between clustering and classification?**  
   A. Clustering is a supervised learning task, while classification is unsupervised  
   B. Clustering is used for finding groupings in data, while classification assigns labels to data points  
   C. Classification requires unlabeled data, while clustering uses labeled data  
   D. There is no difference; both are used for similar purposes  
   **Answer**: B

### ****Deep Learning and Neural Networks****

1. **Which of the following is not a type of neural network?**  
   A. Convolutional Neural Network (CNN)  
   B. Recurrent Neural Network (RNN)  
   C. Naive Bayes Network  
   D. Generative Adversarial Network (GAN)  
   **Answer**: C
2. **In a neural network, what does an epoch refer to?**  
   A. A layer in the network  
   B. A complete pass through the training dataset  
   C. The number of neurons in a layer  
   D. A weight update step  
   **Answer**: B
3. **What does the term "overfitting" mean in the context of machine learning?**  
   A. The model performs well on both training and test data  
   B. The model performs poorly on both training and test data  
   C. The model learns noise and details from the training data, leading to poor generalization  
   D. The model's training time is too short  
   **Answer**: C
4. **What does dropout do in neural networks?**  
   A. Prevents overfitting by randomly setting a fraction of input units to zero during training  
   B. Reduces the number of neurons in each layer  
   C. Increases the learning rate  
   D. Decreases the complexity of the model  
   **Answer**: A
5. **What is the primary purpose of the pooling layer in a CNN?**  
   A. To reduce the size of the input representation and computational complexity  
   B. To classify the features detected by convolutional layers  
   C. To apply an activation function  
   D. To make predictions based on image features  
   **Answer**: A
6. **Which algorithm is often used in recurrent neural networks (RNNs) to address vanishing gradient problems?**  
   A. Long Short-Term Memory (LSTM)  
   B. Convolutional Layer  
   C. Radial Basis Function  
   D. Support Vector Machine  
   **Answer**: A

### ****AI Applications****

1. **Which of the following is a primary use of AI in healthcare?**  
   A. Predicting stock market trends  
   B. Analyzing medical images to assist in diagnosis  
   C. Enhancing search engine algorithms  
   D. Detecting online fraud  
   **Answer**: B
2. **What is an example of an AI application in finance?**  
   A. Self-driving cars  
   B. Fraud detection algorithms  
   C. Image classification  
   D. Natural Language Processing  
   **Answer**: B
3. **How is AI used in e-commerce?**  
   A. Chatbots for customer service  
   B. Predicting customer preferences based on behavior  
   C. Personalizing product recommendations  
   D. All of the above  
   **Answer**: D
4. **In natural language processing (NLP), which of the following is used for machine translation?**  
   A. Support Vector Machines  
   B. Convolutional Neural Networks  
   C. Recurrent Neural Networks  
   D. K-Means Clustering  
   **Answer**: C
5. **Which of the following is a key challenge in AI development?**  
   A. Understanding the problem without data  
   B. Data privacy and security concerns  
   C. Making decisions based on random data  
   D. Using highly structured data for training  
   **Answer**: B

### ****AI Ethics and Challenges****

1. **What is one major ethical concern associated with AI?**  
   A. Ensuring the model is undertrained  
   B. Ensuring AI systems are biased and unfair  
   C. Avoiding human intervention in AI systems  
   D. Reducing the cost of AI implementations  
   **Answer**: B
2. **What does "explainability" in AI refer to?**  
   A. The complexity of AI models  
   B. The ability to understand how an AI model makes decisions  
   C. The use of labeled data in AI training  
   D. The computational speed of AI systems  
   **Answer**: B
3. **Which of the following is true about the "black-box" problem in AI?**  
   A. The model's decision-making process is completely transparent  
   B. The model can explain its decisions in human-readable terms  
   C. The decision-making process inside the model is not interpretable by humans  
   D. Black-box models are preferred in all applications of AI  
   **Answer**: C
4. **What is one of the major risks of AI automation?**  
   A. Increased complexity in decision-making  
   B. Loss of jobs due to automation of tasks  
   C. Decreased human involvement in decision-making  
   D. Overtraining of AI models  
   **Answer**: B
5. **What is "bias in AI" referring to?**  
   A. The algorithm’s inability to learn from the data  
   B. The tendency of AI systems to produce incorrect predictions  
   C. When AI systems make decisions based on skewed or unrepresentative data  
   D. The overfitting of data in AI models  
   **Answer**: C

**Cloud Computing & Professional Ethics**

● Professional Ethics: Ethical considerations in technology and IT

● Load Balancing: Techniques for distributing traffic across servers

● Virtualization: Containers (e.g., Docker), Virtual machines

### ****Professional Ethics in Technology and IT****

1. **Which of the following is an ethical concern regarding AI in decision-making?**  
   A. Privacy violations  
   B. Increased computational speed  
   C. Improved user experience  
   D. Easier data processing  
   **Answer**: A
2. **What is the purpose of the "Digital Millennium Copyright Act" (DMCA)?**  
   A. To regulate social media platforms  
   B. To prevent unauthorized copying and distribution of software  
   C. To govern the usage of personal data in online platforms  
   D. To ensure transparency in machine learning algorithms  
   **Answer**: B
3. **Which of the following best represents an ethical challenge in cloud computing?**  
   A. Data storage location transparency  
   B. Integration of legacy systems  
   C. Scalability of cloud infrastructure  
   D. Reduced operational cost  
   **Answer**: A
4. **Which ethical principle involves ensuring that AI systems are fair, transparent, and accountable?**  
   A. Autonomy  
   B. Beneficence  
   C. Justice  
   D. Non-maleficence  
   **Answer**: C
5. **What does the "right to be forgotten" mean in the context of data privacy?**  
   A. Users can freely share personal data  
   B. Users can request the deletion of their personal data from online systems  
   C. Users must store all their data in a secure database  
   D. Users cannot request data changes after submission  
   **Answer**: B
6. **What ethical issue arises from using personal data without user consent in cloud computing?**  
   A. Data portability  
   B. Data transparency  
   C. Data security  
   D. Privacy violation  
   **Answer**: D
7. **Which of the following is a significant ethical consideration for cloud service providers?**  
   A. Minimizing operational costs  
   B. Ensuring data sovereignty and user privacy  
   C. Enhancing system performance  
   D. Expanding cloud storage options  
   **Answer**: B
8. **What is the purpose of "informed consent" in data processing?**  
   A. To allow companies to collect data without limitations  
   B. To ensure that individuals are aware of how their data will be used  
   C. To prevent the collection of any user data  
   D. To store data in encrypted formats  
   **Answer**: B

### ****Cloud Computing: Load Balancing and Virtualization****

1. **Which of the following is the primary goal of load balancing?**  
   A. To reduce the cost of cloud services  
   B. To distribute network traffic evenly across multiple servers  
   C. To minimize the number of virtual machines  
   D. To store data in different geographic locations  
   **Answer**: B
2. **Which of the following is a common technique used in load balancing?**  
   A. Round-robin  
   B. Least connections  
   C. IP Hash  
   D. All of the above  
   **Answer**: D
3. **Which cloud computing model provides the most flexibility and control for the user?**  
   A. Software as a Service (SaaS)  
   B. Platform as a Service (PaaS)  
   C. Infrastructure as a Service (IaaS)  
   D. Function as a Service (FaaS)  
   **Answer**: C
4. **Which of the following is NOT a characteristic of cloud computing?**  
   A. On-demand self-service  
   B. Broad network access  
   C. Limited resource scalability  
   D. Resource pooling  
   **Answer**: C
5. **What does the term "elasticity" mean in the context of cloud computing?**  
   A. The ability to automatically scale resources up or down based on demand  
   B. The flexibility to run multiple operating systems  
   C. The deployment of all cloud resources within a single data center  
   D. The permanent allocation of resources  
   **Answer**: A
6. **In virtualization, which of the following is responsible for managing virtual machines?**  
   A. Hypervisor  
   B. Virtual Private Network (VPN)  
   C. Container engine  
   D. Database management system  
   **Answer**: A
7. **Which of the following is an advantage of containerization (e.g., Docker) over virtual machines?**  
   A. Containers require a full operating system for each instance  
   B. Containers are faster and more lightweight than virtual machines  
   C. Containers use more resources than virtual machines  
   D. Containers cannot run on any operating system  
   **Answer**: B
8. **Which of the following best describes a virtual machine?**  
   A. A lightweight, isolated environment that can run applications  
   B. A program that packages applications and their dependencies  
   C. An operating system running on top of physical hardware  
   D. A hypervisor managing the virtualization environment  
   **Answer**: C
9. **What is a "Docker container"?**  
   A. A virtualized environment running multiple applications  
   B. A lightweight, portable, and isolated execution environment for running applications  
   C. A physical server designed for application hosting  
   D. A cloud service offering computing resources  
   **Answer**: B
10. **Which of the following is a key difference between containers and virtual machines?**  
    A. Containers run on the host operating system, while VMs include an entire operating system  
    B. Containers require more system resources than VMs  
    C. VMs are used for lightweight applications, while containers are for heavy applications  
    D. VMs are not portable, while containers can be easily moved between systems  
    **Answer**: A
11. **In cloud computing, what is the main benefit of using serverless computing?**  
    A. It reduces the number of servers required for a workload  
    B. It eliminates the need for a cloud provider  
    C. It allows automatic scaling of applications without managing servers  
    D. It provides access to unlimited storage  
    **Answer**: C
12. **What is the primary purpose of a "load balancer" in cloud environments?**  
    A. To monitor the availability of servers  
    B. To automate the deployment of applications  
    C. To distribute traffic across servers to ensure reliability and performance  
    D. To back up data from virtual machines  
    **Answer**: C

### ****Professional Ethics in Technology****

1. **Which of the following is an ethical consideration when using cloud-based data storage?**  
   A. Ensuring physical server security  
   B. Managing data access control and encryption  
   C. Setting up network firewalls  
   D. Expanding storage capacity  
   **Answer**: B
2. **What is the main responsibility of IT professionals in ensuring ethical use of technology?**  
   A. Ensuring high-speed internet access  
   B. Protecting user privacy and maintaining security  
   C. Making technology affordable for all users  
   D. Expanding digital services to every region  
   **Answer**: B
3. **What is the ethical issue related to "deepfake" technology?**  
   A. Inaccurate data processing  
   B. Use in creating misleading or harmful media  
   C. Reduction in media quality  
   D. Inability to detect genuine content  
   **Answer**: B
4. **Which of the following is an example of a breach of professional ethics in the IT industry?**  
   A. Failing to update software patches regularly  
   B. Using a colleague's code without attribution  
   C. Sharing best practices with peers  
   D. Collaborating with other professionals on a project  
   **Answer**: B
5. **Which of the following is a key principle in ethical AI development?**  
   A. Ensuring AI is biased and unbiased at the same time  
   B. Ensuring the AI system is secure and safe to use  
   C. Ensuring AI is free from data protection laws  
   D. Allowing AI to learn without human intervention  
   **Answer**: B

### ****Cloud Computing Virtualization and Load Balancing****

1. **Which of the following is the most commonly used hypervisor for creating and managing virtual machines in a cloud environment?**  
   A. Docker  
   B. VMware  
   C. Kubernetes  
   D. Apache Hadoop  
   **Answer**: B
2. **What type of load balancing method involves distributing requests based on the number of connections each server is handling?**  
   A. Round Robin  
   B. Least Connections  
   C. IP Hashing  
   D. Weighted Round Robin  
   **Answer**: B
3. **What is one of the primary reasons for using virtualization in cloud computing?**  
   A. To reduce the cost of data storage  
   B. To improve performance by running all services on one server  
   C. To provide isolated environments for running different applications  
   D. To increase the number of physical servers  
   **Answer**: C
4. **Which of the following is an example of a cloud computing service model?**  
   A. Docker  
   B. Kubernetes  
   C. Software as a Service (SaaS)  
   D. Virtual Machine Monitor (VMM)  
   **Answer**: C
5. **Which of the following is NOT a typical use case for containers?**  
   A. Running a microservices-based application  
   B. Testing multiple versions of an application  
   C. Running large monolithic applications  
   D. Deploying applications in different environments  
   **Answer**: C

### ****Professional Ethics in Technology and IT****

1. **What is a key ethical responsibility of an IT professional when developing software?**  
   A. To ensure it is bug-free  
   B. To guarantee it is always open-source  
   C. To make sure it adheres to privacy standards and user consent  
   D. To make it commercially successful  
   **Answer**: C
2. **Which of the following best describes "data sovereignty"?**  
   A. Data is stored in a globally accessible location  
   B. Data is stored and governed by the laws of the country in which it is stored  
   C. Data cannot be shared between countries  
   D. Data storage costs are minimized  
   **Answer**: B
3. **What does the principle of "do no harm" imply in the context of AI development?**  
   A. AI should only perform tasks that humans cannot do  
   B. AI should be programmed to act without causing any adverse effects to individuals or society  
   C. AI systems must be free from human oversight  
   D. AI should be as intelligent as possible  
   **Answer**: B
4. **How can an IT professional mitigate the risks of data breaches?**  
   A. By encrypting sensitive data and applying access control mechanisms  
   B. By focusing on hardware upgrades  
   C. By minimizing the number of software features  
   D. By reducing the use of cloud services  
   **Answer**: A
5. **Which of the following is an example of a conflict of interest for an IT professional?**  
   A. Using a personal device to store work-related files  
   B. Working on a project for a competitor without disclosing it to your employer  
   C. Collaborating on an open-source project  
   D. Taking a course on a new technology  
   **Answer**: B

### ****Cloud Computing: Load Balancing and Virtualization****

1. **Which of the following is NOT a key benefit of load balancing?**  
   A. High availability  
   B. Efficient resource utilization  
   C. Decreased server capacity  
   D. Fault tolerance  
   **Answer**: C
2. **What is the main function of a reverse proxy in a cloud environment?**  
   A. To route incoming requests to backend servers  
   B. To serve as an interface between users and the load balancer  
   C. To balance the load between servers  
   D. To monitor server performance  
   **Answer**: A
3. **Which of the following is a benefit of using cloud services for virtualization?**  
   A. Physical servers are always required  
   B. Reduced time for server provisioning and management  
   C. Less secure data storage  
   D. Increased complexity in network management  
   **Answer**: B
4. **In the context of cloud computing, what does the term "scalability" refer to?**  
   A. The ability to distribute data across multiple servers  
   B. The ability to handle increased workloads by adding resources  
   C. The ability to access services from multiple locations  
   D. The ability to encrypt data  
   **Answer**: B
5. **Which of the following describes "horizontal scaling" in cloud environments?**  
   A. Adding more resources (like memory or CPU) to a single machine  
   B. Increasing the size of individual virtual machines  
   C. Adding more instances of virtual machines or containers to handle more traffic  
   D. Encrypting data to enhance security  
   **Answer**: C
6. **Which of the following is a key advantage of using virtual machines over physical servers?**  
   A. Virtual machines require no energy to operate  
   B. Virtual machines can be quickly deployed and configured for various applications  
   C. Virtual machines never fail  
   D. Virtual machines do not require network connectivity  
   **Answer**: B
7. **What is a "container image" in Docker?**  
   A. A backup of a running container  
   B. A lightweight, standalone, and executable package that includes everything needed to run an application  
   C. A type of hypervisor  
   D. A method for monitoring containers  
   **Answer**: B
8. **In virtualization, what does "overcommitment" refer to?**  
   A. Allocating more resources to virtual machines than are physically available  
   B. Distributing workloads between multiple virtual machines  
   C. Running several applications on a single physical machine  
   D. Increasing the number of virtual machines in a data center  
   **Answer**: A
9. **Which of the following describes "elastic load balancing" in the cloud?**  
   A. It automatically adjusts the distribution of traffic based on server availability and demand  
   B. It distributes traffic evenly across all servers regardless of server load  
   C. It uses static algorithms to balance the load  
   D. It routes all traffic to a single server for simplicity  
   **Answer**: A
10. **Which of the following best describes a container orchestration platform like Kubernetes?**  
    A. A tool that allows managing containers at scale, automating deployment, and scaling applications  
    B. A type of container that runs applications  
    C. A system that stores container images  
    D. A programming language used to manage containers  
    **Answer**: A

### ****Professional Ethics in Cloud Computing****

1. **Which of the following is an ethical issue associated with cloud computing?**  
   A. Limited scalability  
   B. Data privacy and security concerns  
   C. Lack of availability zones  
   D. High cost of infrastructure  
   **Answer**: B
2. **What is a key principle of the General Data Protection Regulation (GDPR) concerning cloud services?**  
   A. Data should be stored in a public cloud only  
   B. Data must be encrypted using open-source methods  
   C. Users should have the right to access, correct, and delete their data  
   D. Cloud providers should not charge for data processing  
   **Answer**: C
3. **Which of the following is a potential risk when using cloud services?**  
   A. Reduced data storage costs  
   B. Data breaches and loss of control over sensitive information  
   C. Increased speed of service delivery  
   D. Greater compliance with industry standards  
   **Answer**: B
4. **What is the ethical responsibility of cloud service providers concerning user data?**  
   A. They must monitor user activity to ensure compliance with local laws  
   B. They must share user data with third parties to increase revenue  
   C. They must guarantee that user data is securely stored and processed  
   D. They must prevent users from accessing their own data  
   **Answer**: C
5. **What does "data integrity" refer to in the context of cloud computing?**  
   A. The ability to share data across different cloud services  
   B. The protection of data from unauthorized access or corruption  
   C. The speed at which data can be accessed  
   D. The storage of data in multiple physical locations  
   **Answer**: B

### ****Virtualization, Load Balancing, and Cloud Infrastructure****

1. **Which of the following is a feature of cloud-native applications?**  
   A. They rely heavily on physical infrastructure  
   B. They are designed to be scalable, flexible, and resilient to failures  
   C. They require dedicated hardware  
   D. They are limited to single-tenant environments  
   **Answer**: B
2. **Which of the following tools is commonly used for orchestration in cloud environments?**  
   A. Docker  
   B. Kubernetes  
   C. Hyper-V  
   D. VMware ESXi  
   **Answer**: B
3. **What is the main advantage of using hybrid cloud architecture?**  
   A. It provides the same services as a private cloud  
   B. It allows integration of on-premises infrastructure with cloud resources for flexibility and control  
   C. It eliminates the need for cloud service providers  
   D. It is designed to work with public clouds only  
   **Answer**: B
4. **What is a "container runtime" in Docker?**  
   A. A service for storing container images  
   B. The tool responsible for running containers on a system  
   C. A network service used for container communication  
   D. The platform used to create containerized applications  
   **Answer**: B
5. **Which of the following is NOT typically a responsibility of cloud service providers?**  
   A. Ensuring data availability  
   B. Encrypting user data  
   C. Implementing physical security controls  
   D. Monitoring end-user activity  
   **Answer**: D

**ALL**

### ****Programming and Software Development****

1. What does **SDLC** stand for in software development?  
   a) Software Development Life Cycle  
   b) System Design Logical Controller  
   c) System Deployment Life Cycle  
   d) Software Debugging Logical Code  
   **Answer:** a
2. Which programming paradigm focuses on **objects** containing data and behavior?  
   a) Procedural Programming  
   b) Functional Programming  
   c) Object-Oriented Programming  
   d) Logical Programming  
   **Answer:** c
3. In Agile methodology, what is a **Sprint**?  
   a) A meeting to discuss project timelines  
   b) A specific time period during which tasks are completed  
   c) A stage of development testing  
   d) A backlog refinement session  
   **Answer:** b

### ****2. Networking****

1. Which protocol is responsible for transferring files over the internet?  
   a) FTP  
   b) HTTP  
   c) SMTP  
   d) SNMP  
   **Answer:** a
2. In networking, what is the default port number for **HTTPS**?  
   a) 80  
   b) 21  
   c) 443  
   d) 25  
   **Answer:** c
3. What does the **IP** in "IP address" stand for?  
   a) Internet Process  
   b) Internet Protocol  
   c) Internal Processing  
   d) Integrated Protocol  
   **Answer:** b
4. Which of the following is used to convert domain names into IP addresses?  
   a) DHCP  
   b) DNS  
   c) TCP  
   d) ARP  
   **Answer:** b

**Cybersecurity**

1. What is the primary function of a **firewall**?  
   a) Encrypt data for secure transmission  
   b) Prevent unauthorized access to or from a private network  
   c) Scan systems for malware  
   d) Authenticate users  
   **Answer:** b
2. Which of the following is **not** a form of malware?  
   a) Virus  
   b) Firewall  
   c) Worm  
   d) Trojan horse  
   **Answer:** b
3. What is **phishing**?  
   a) A method of testing software vulnerabilities  
   b) A technique used to steal sensitive information via deceptive emails or websites  
   c) Scanning a network for open ports  
   d) Encrypting data to prevent access  
   **Answer:** b
4. What does **SSL** stand for in secure communications?  
   a) Secure Sockets Layer  
   b) Secure Server Log  
   c) Simple Socket Layer  
   d) Secure System Link  
   **Answer:** a

### ****4. Databases****

1. Which of the following is a **relational database management system (RDBMS)**?  
   a) MongoDB  
   b) Oracle  
   c) Neo4j  
   d) Cassandra  
   **Answer:** b
2. What does **ACID** stand for in database transactions?  
   a) Atomicity, Consistency, Isolation, Durability  
   b) Accuracy, Consistency, Integration, Durability  
   c) Atomicity, Clarity, Isolation, Dependability  
   d) Authentication, Consistency, Integrity, Distribution  
   **Answer:** a
3. Which SQL command is used to remove rows from a table?  
   a) DELETE  
   b) DROP  
   c) TRUNCATE  
   d) REMOVE  
   **Answer:** a
4. In SQL, which clause is used to filter results based on a condition?  
   a) SELECT  
   b) WHERE  
   c) FROM  
   d) GROUP BY  
   **Answer:** b

### ****5. Operating Systems****

1. Which of the following is an example of an **open-source operating system**?  
   a) Windows 10  
   b) MacOS  
   c) Linux  
   d) Solaris  
   **Answer:** c
2. What is the purpose of **virtual memory** in an operating system?  
   a) To store frequently used files  
   b) To provide additional storage for installed programs  
   c) To simulate additional RAM using disk space  
   d) To protect system files from unauthorized access  
   **Answer:** c
3. Which process scheduling algorithm always selects the process with the smallest execution time?  
   a) First Come First Serve (FCFS)  
   b) Round Robin  
   c) Shortest Job Next (SJN)  
   d) Priority Scheduling  
   **Answer:** c

### ****6. General IT Knowledge****

1. What does **IoT** stand for?  
   a) Internet of Transactions  
   b) Internet of Technology  
   c) Internet of Things  
   d) Information of Technology  
   **Answer:** c
2. Which of the following is a **version control system** widely used in IT projects?  
   a) Git  
   b) Docker  
   c) Jenkins  
   d) Kubernetes  
   **Answer:** a
3. In cloud computing, which service model provides virtualized hardware over the internet?  
   a) SaaS (Software as a Service)  
   b) IaaS (Infrastructure as a Service)  
   c) PaaS (Platform as a Service)  
   d) HaaS (Hardware as a Service)  
   **Answer:** b
4. What does **HTTP 404** indicate?  
   a) Server is overloaded  
   b) Requested resource was not found  
   c) Server is unavailable  
   d) Bad request  
   **Answer:** b
5. **1. What is the primary goal of load balancing in cloud computing?**

a) To increase the number of servers  
b) To distribute incoming traffic across multiple servers evenly  
c) To reduce cloud storage costs  
d) To encrypt data during transmission

**Answer**: b) To distribute incoming traffic across multiple servers evenly

1. **2. Which of the following is a virtualization technology?**

a) HTTP  
b) Docker  
c) SQL  
d) Git

**Answer**: b) Docker

1. **3. Which of these is NOT an advantage of virtualization?**

a) Better resource utilization  
b) Simplified disaster recovery  
c) Increased physical hardware costs  
d) Easier scalability

**Answer**: c) Increased physical hardware costs

1. **4. What is a container in cloud computing?**

a) A physical server used to store data  
b) A lightweight, standalone package containing all dependencies for an application  
c) A backup storage device  
d) A network device to prevent cyberattacks

**Answer**: b) A lightweight, standalone package containing all dependencies for an application

1. **Which of the following is NOT a virtual machine hypervisor?**

a) VMware  
b) VirtualBox  
c) KVM  
d) GitHub

**Answer**: d) GitHub

1. **What is the primary function of a hypervisor in virtualization?**

a) To allocate IP addresses to servers  
b) To manage virtual machines on a host system  
c) To encrypt virtual machines for security  
d) To act as a backup solution for the cloud

**Answer**: b) To manage virtual machines on a host system

**855. In professional ethics, which of the following represents an ethical issue in IT?**

a) Securing customer data  
b) Exploiting user data without consent  
c) Building secure software  
d) Testing software functionality

**Answer**: b) Exploiting user data without consent

1. **What is an important ethical consideration in cloud computing?**

a) Avoiding backups  
b) Ensuring data privacy and compliance with regulations  
c) Ignoring user permissions  
d) Avoiding multi-factor authentication

**Answer**: b) Ensuring data privacy and compliance with regulations

**856. Which of the following is a characteristic of private cloud deployment?**

a) Available to the general public  
b) Dedicated infrastructure for a single organization  
c) Resources are shared among multiple organizations  
d) No access control measures are required

**Answer**: b) Dedicated infrastructure for a single organization

**857. What does Docker primarily use for application virtualization?**

a) Virtual machines  
b) Containers  
c) Physical servers  
d) Firewalls

**Answer**: b) Containers

**858. Which of the following load balancing techniques distributes traffic based on server response times?**

a) Round-robin  
b) Least connections  
c) Least response time  
d) Static allocation

**Answer**: c) Least response time

1. **In virtualization, what is the main purpose of a virtual machine?**

a) To connect two networks  
b) To simulate a physical machine and run applications  
c) To manage containerized applications  
d) To perform real-time backups

**Answer**: b) To simulate a physical machine and run applications

**1. Programming Fundamentals**

**1.1 Basic Concepts**

1. **What is the size of the int data type in most 64-bit systems?**  
   a) 2 bytes  
   b) 4 bytes  
   c) 8 bytes  
   d) 16 bytes

**Answer**: b) 4 bytes

**1.2 Control Structures**

**2. What is the output of the following code snippet?**

int x = 5;

if (x > 3) {

printf("A");

} else {

printf("B");

}

a) A  
b) B  
c) AB  
d) Compilation Error

**Answer**: a) A

**1.3 Functions**

1. **Which of these is an advantage of recursion?**  
   a) It requires less memory than iterative solutions.  
   b) It simplifies code for problems like factorial or Fibonacci.  
   c) It is faster than loops.  
   d) It cannot be used in C.

**Answer**: b) It simplifies code for problems like factorial or Fibonacci.

**1.4 Error Handling**

1. **In a try-catch block, what does the catch block handle?**  
   a) Compilation errors  
   b) Syntax errors  
   c) Runtime exceptions  
   d) All of the above

**Answer**: c) Runtime exceptions

**1.5 Pointers**

**5. What is stored in a pointer variable?**  
a) Value of a variable  
b) Address of a variable  
c) Data type of a variable  
d) None of the above

**Answer**: b) Address of a variable

**1.6 OOP**

1. **Which of the following is NOT a pillar of Object-Oriented Programming (OOP)?**  
   a) Encapsulation  
   b) Abstraction  
   c) Polymorphism  
   d) Normalization

**Answer**: d) Normalization

**2. Data Structures and Algorithms**

1. **What is the time complexity of a binary search algorithm?**  
   a) O(1)  
   b) O(n)  
   c) O(log n)  
   d) O(n log n)

**Answer**: c) O(log n)

1. **In a stack, which operation adds an element to the stack?**  
   a) pop  
   b) push  
   c) enqueue  
   d) insert

**Answer**: b) push

1. **Which sorting algorithm has the best-case time complexity of O(n)?**  
   a) Quick Sort  
   b) Bubble Sort  
   c) Merge Sort  
   d) Insertion Sort

**Answer**: d) Insertion Sort

**3. Databases**

1. **What does the SQL statement SELECT \* FROM table; do?**  
   a) Deletes all data in the table  
   b) Selects all columns and rows from the table  
   c) Selects only the primary key column  
   d) Updates all rows in the table

**Answer**: b) Selects all columns and rows from the table

1. **Which normal form eliminates partial dependencies?**  
   a) 1NF  
   b) 2NF  
   c) 3NF  
   d) BCNF

**Answer**: b) 2NF

**4. Operating Systems**

1. **What is the primary purpose of a scheduler in an operating system?**  
   a) Managing I/O devices  
   b) Allocating memory to processes  
   c) Managing CPU time among processes  
   d) Managing file systems

**Answer**: c) Managing CPU time among processes

1. **In virtual memory, which technique allows a program to execute even if it's partially loaded into memory?**  
   a) Paging  
   b) Scheduling  
   c) Thrashing  
   d) Fragmentation

**Answer**: a) Paging

**5. Networking**

1. **Which protocol is used for secure communication over a network?**  
   a) HTTP  
   b) HTTPS  
   c) FTP  
   d) UDP

**Answer**: b) HTTPS

1. **How many layers are there in the OSI model?**  
   a) 4  
   b) 5  
   c) 7  
   d) 8

**Answer**: c) 7

**6. Web Development**

1. **What does HTML stand for?**  
   a) Hyper Text Markup Language  
   b) High Text Machine Language  
   c) Hyperlink Text Markup Language  
   d) Hyperlink and Text Markup Language

**Answer**: a) Hyper Text Markup Language

1. **Which CSS property is used to change the background color of an element?**  
   a) color  
   b) background-color  
   c) bg-color  
   d) bgcolor

**Answer**: b) background-color

**7. Cybersecurity**

1. **What is ransomware?**  
   a) A type of hardware  
   b) A program that encrypts data and demands payment to decrypt it  
   c) A secure method of transmitting data  
   d) A type of firewall

**Answer**: b) A program that encrypts data and demands payment to decrypt it

1. **Which of the following is a symmetric encryption algorithm?**  
   a) RSA  
   b) AES  
   c) SHA  
   d) MD5

**Answer**: b) AES

**8. Software Engineering**

1. **What does SDLC stand for?**  
   a) Software Design Life Cycle  
   b) System Development Life Cycle  
   c) Software Development Life Cycle  
   d) System Design Life Cycle

**Answer**: c) Software Development Life Cycle

1. **Which version control command is used to clone a repository in Git?**  
   a) git copy  
   b) git clone  
   c) git pull  
   d) git fork

**Answer**: b) git clone

**9. Artificial Intelligence**

1. **Which of the following is an example of unsupervised learning?**  
   a) Classification  
   b) Regression  
   c) Clustering  
   d) Neural Networks

**Answer**: c) Clustering

1. **What does NLP stand for in AI?**  
   a) Natural Learning Processing  
   b) Natural Language Processing  
   c) Neural Logic Processing  
   d) Neural Language Prediction

**Answer**: b) Natural Language Processing

**10. Cloud Computing & Professional Ethics**

1. **Which of the following is a public cloud service provider?**  
   a) AWS  
   b) Docker  
   c) VirtualBox  
   d) Apache

**Answer**: a) AWS

1. **In professional ethics, which principle ensures that technology should not harm users?**  
   a) Accountability  
   b) Non-maleficence  
   c) Autonomy  
   d) Integrity

**Answer**: b) Non-maleficence

**1. Programming Fundamentals**

**1.1 Syntax**

1. **What symbol is used to end a statement in C, C++, and Java?**  
   a) . (dot)  
   b) ; (semicolon)  
   c) , (comma)  
   d) : (colon)

**Answer**: b) ; (semicolon)

**1.2 Loops**

1. **What is the output of the following Python code?**

for i in range(3):

print(i, end=" ")

a) 1 2 3  
b) 0 1 2  
c) 0 1 2 3  
d) 1 2

**Answer**: b) 0 1 2

**1.3 Functions**

1. **Which of the following statements is true about recursion?**  
   a) Every recursion must include a base case.  
   b) Recursive functions are faster than iterative ones.  
   c) Recursive functions use less memory than loops.  
   d) Recursion is only used for sorting algorithms.

**Answer**: a) Every recursion must include a base case.

**2. Data Structures and Algorithms**

1. **Which data structure is used in a breadth-first search (BFS) algorithm?**  
   a) Stack  
   b) Queue  
   c) Linked List  
   d) Hash Table

**Answer**: b) Queue

1. **What is the best-case time complexity of a bubble sort?**  
   a) O(n²)  
   b) O(log n)  
   c) O(n)  
   d) O(n log n)

**Answer**: c) O(n)

1. **Which of these data structures is hierarchical?**  
   a) Array  
   b) Stack  
   c) Tree  
   d) Queue

**Answer**: c) Tree

**3. Databases**

1. **What is a primary key in a database?**  
   a) A column that holds duplicate values  
   b) A column with unique and non-null values  
   c) A key used for data encryption  
   d) A foreign key
2. **Answer**: b) A column with unique and non-null values
3. **Which SQL command is used to retrieve data from a table?**  
   a) GET  
   b) FETCH  
   c) SELECT  
   d) RETRIEVE

**Answer**: c) SELECT

1. **What is the purpose of database normalization?**  
   a) To increase data redundancy  
   b) To reduce data redundancy  
   c) To optimize indexing  
   d) To improve SQL execution

**Answer**: b) To reduce data redundancy

**4. Operating Systems**

1. **Which of the following algorithms is used for deadlock prevention?**  
   a) Banker’s Algorithm  
   b) Round-Robin Scheduling  
   c) FIFO  
   d) Best Fit

**Answer**: a) Banker’s Algorithm

1. **What does context switching refer to in operating systems?**  
   a) Allocating memory to processes  
   b) Switching the state of a process to another  
   c) Swapping out an application to the hard disk  
   d) Restarting a process after a failure

**Answer**: b) Switching the state of a process to another

**5. Networking**

1. **What is the primary purpose of a MAC address?**  
   a) To identify a device in a network  
   b) To assign an IP address to a device  
   c) To provide security to data  
   d) To compress network traffic

**Answer**: a) To identify a device in a network

1. **What type of network is typically used within a building?**  
   a) WAN  
   b) LAN  
   c) PAN  
   d) MAN

**Answer**: b) LAN

1. **Which layer of the OSI model is responsible for encryption?**  
   a) Physical Layer  
   b) Transport Layer  
   c) Application Layer  
   d) Presentation Layer
2. **Answer**: d) Presentation Layer

**6. Web Development**

1. **Which HTML tag is used to create a hyperlink?**  
   a) <link>  
   b) <a>  
   c) <href>  
   d) <hyper>

**Answer**: b) <a>

1. **Which CSS property changes the text color of an element?**  
   a) text-color  
   b) font-color  
   c) color  
   d) style-color

**Answer**: c) color

**7. Cybersecurity**

1. **Which of the following is an example of asymmetric encryption?**  
   a) AES  
   b) DES  
   c) RSA  
   d) Blowfish

**Answer**: c) RSA

1. **A DDoS attack is intended to:**  
   a) Steal confidential data  
   b) Encrypt data on a victim’s system  
   c) Overwhelm a server with traffic  
   d) Inject malware into a system

**Answer**: c) Overwhelm a server with traffic

**8. Software Engineering**

1. **In Agile methodology, what does the term “sprint” refer to?**  
   a) A testing phase  
   b) A short, time-boxed period for completing specific tasks  
   c) The deployment of a product  
   d) A brainstorming session

**Answer**: b) A short, time-boxed period for completing specific tasks

1. **What is a repository in version control systems?**  
   a) A temporary storage location for files  
   b) A centralized location to store and manage files  
   c) A testing environment for software  
   d) An encrypted backup of software

**Answer**: b) A centralized location to store and manage files

**9. Artificial Intelligence**

1. **In machine learning, which step comes after data preprocessing?**  
   a) Model evaluation  
   b) Feature extraction  
   c) Model training  
   d) Deployment

**Answer**: c) Model training

1. **What is the main difference between supervised and unsupervised learning?**  
   a) Supervised learning requires labeled data, while unsupervised learning does not.  
   b) Supervised learning is faster than unsupervised learning.  
   c) Supervised learning does not require a training phase.  
   d) Unsupervised learning always provides better accuracy.

**Answer**: a) Supervised learning requires labeled data, while unsupervised learning does not.

**10. Cloud Computing & Professional Ethics**

**997. Which of the following is a benefit of cloud computing?**  
a) Data is always stored on local servers.  
b) High scalability and flexibility.  
c) Reduced data security.  
d) Limited access to computing resources.

**Answer**: b) High scalability and flexibility.

1. **What is the role of a firewall in cybersecurity?**  
   a) Encrypting data during transmission  
   b) Blocking unauthorized access to a network  
   c) Preventing hardware failures  
   d) Detecting software bugs

**Answer**: b) Blocking unauthorized access to a network