How does the Quick Sort algorithm handle elements equal to the pivot?

a. All equal elements go to the left subarray

b. Equal elements can go to either subarray.

c. All equal elements go to the right subarray

d. It does not handle equal elements

Which of the following is a key concept in the Merge Sort algorithm?

a. Divide and Conquer

b. Dynamic Programming

c. Backtracking

d. Greedy Method

What is the time complexity of building a max heap from an unsorted array?

a. O(logn)

b. O(n^2)

c. O(nlogn)

d. O(n)

How is the prefix table in the KMP algorithm constructed?

a. By comparing the pattern with itself

b. By comparing the pattern with the text

c. By sorting the pattern

d. By reversing the pattern

Which of the following is a disadvantage of Run Length Encoding?

a. It loses data during compression

b. It requires a lot of memory

c. It is not effective on data without many repeated characters

d. It is difficult to implement

Radix Sort is particularly effective for sorting which type of data?

a. General-purpose data

b. Floating-point numbers

c. Linked lists

d. Large integers and fixed-length strings

Which of the following is a characteristic of a good hash function?

a. It generates the same hash value for all inputs

b. It uses complex mathematical operations

c. It maps inputs to hash values as uniformly as possible

d. It produces large hash values

In LZW, what does the decompressor need to correctly decompress the data?

a. The hash table used during compression

b. The original dictionary used for compression

c. The same initial dictionary and the compressed data

d. Only the compressed data

How does the LZW algorithm (a variant of LZ78) differ from LZ78?

a. LZW starts with an initial dictionary of all possible symbols

b. LZW uses a sliding window like LZ77

c. LZW is a lossy compression algorithm

d. LZW compresses data more slowly than LZ78

Which of the following scenarios can cause Quick Sort to perform poorly?

a. When all elements are distinct

b. When the pivot is always the smallest element

c. When all elements are the same

d. When the array is already sorted

What is the main disadvantage of Merge Sort?

a. It requires additional memory space

b. It cannot handle large datasets

c. It has a high time complexity

d. It is not a stable sorting algorithm

Which of the following is not a step in the Heap Sort algorithm?

a. Restoring the heap property after extraction

b. Building a max heap

c. Merging two sorted arrays

d. Extracting elements one by one

Which of the following is true about Huffman coding?

a. It does not use a binary tree structure

b. It is a lossy compression algorithm

c. It assigns shorter codes to more frequent characters

d. It assigns shorter codes to less frequent characters

What is the time complexity of the KMP string matching algorithm?

a. O(n⋅m)

b. O(m^2)

c. O(n+m)

d. O(n^2)

Given the input string "AAAABBBCCDAA", what would be the output after applying Run Length Encoding?

a. A4B3C2D1A2

b. 3A4B2C1D3A

c. 4A3B2C1D2A

d. AAAABBBCCDAA

Which of the following is used as a pivot in Quick Sort?

a. The last element

b. The first element

c. Any of the above

d. A random element

Which of the following is NOT a characteristic of Huffman coding?

a. It is a type of variable-length coding

b. It can result in ambiguous codes

c. It is an optimal prefix code

d. It guarantees the shortest average code length

What is the time complexity of the Brute-Force string matching algorithm?

a. O(n+m)

b. O(m^2)

c. O(n⋅m)

d. O(n^2)

What is a collision in a hash table?

a. When a key does not map to any hash value

b. When two different keys map to the same hash value

c. When two different keys map to different hash values

d. When a hash function is too complex

Which hash function is known for its simplicity and effectiveness?

a. MD5

b. SHA-256

c. Multiplication method

d. Division method

Which of the following is true about the partition process in Quick Sort?

a. It requires extra space for temporary arrays

b. It can result in one very small and one very large subarray

c. It does not compare elements

d. It always divides the array into two equal halves

What will be the state of the array [5, 1, 4, 2, 8] after the first complete pass of Bubble Sort?

a. 1, 2, 4, 5, 8

b. 5, 1, 4, 2, 8

c. 1, 5, 4, 2, 8

d. 1, 4, 2, 5, 8

Which of the following is a collision resolution technique that uses linked lists?

a. Chaining

b. Linear Probing

c. Quadratic Probing

d. Double Hashing

What happens when a hash table's load factor exceeds a certain threshold?

a. Sorting

b. Splitting

c. Rehashing

d. Merging

Which file format commonly uses the LZW algorithm for compression?

a. JPEG

b. MP3

c. GIF

d. PNG

In Selection Sort, what is the primary operation performed in the inner loop?

a. Finding the minimum element in the unsorted subarray

b. Merging two sorted subarrays

c. Inserting the current element in its correct position

d. Comparing and possibly swapping adjacent elements

What is the primary difference between LZ77 and LZ78?

a. LZ77 is a lossy algorithm, LZ78 is lossless

b. LZ77 requires more memory than LZ78

c. LZ77 is used for image compression, LZ78 is used for text compression

d. LZ77 uses a sliding window, LZ78 uses a dictionary

Which of the following is a disadvantage of the Brute-Force string matching algorithm?

a. It requires additional space

b. It does not work for all types of texts

c. It is difficult to implement

d. It is not efficient for large texts

In the worst case, what is the time complexity of Merge Sort?

a. O(n^2)

b. O(n log n)

c. O(log n)

d. O(n)

What is the space complexity of Radix Sort?

a. O(n^2)

b. O(n)

c. O(n+k)

d. O(1)

Which of the following best describes the Merge operation in Merge Sort?

a. Finding the pivot element

b. Combining two sorted subarrays into one sorted array

c. Reversing the array

d. Dividing the array into two halves

When would it be practical to use the Brute-Force string matching algorithm?

a. When the text is very large

b. When the pattern is very long

c. When the text and pattern are both very small

d. When the text is a binary file

What is the main advantage of the Knuth-Morris-Pratt (KMP) algorithm over the Brute-Force algorithm?

a. It requires less space

b. It has a linear time complexity

c. It works only for small texts

d. It is simpler to implement

Which of the following is true about the codes assigned in Huffman coding?

a. Codes are assigned based on character ASCII values

b. All codes are of the same length

c. Codes are longer for more frequent characters

d. No code is a prefix of any other code

What is the average-case time complexity of Quick Sort?

a. O(n)

b. O(n^2)

c. O(n log n)

d. O(log n)

Which of the following statements is true about the Selection Sort algorithm?

a. It is a stable sorting algorithm

b. It always performs better than Insertion Sort

c. It repeatedly selects the smallest element from the unsorted part of the array

d. It requires O(n) extra space

In the context of Heap Sort, what is “heapify”?

a. The process of removing the root of the heap

b. The process of merging two heaps

c. The process of dividing the array into sub-arrays

d. The process of transforming a binary tree into a heap

Which type of data is Run Length Encoding most effective at compressing?

a. Data with evenly distributed character frequencies

b. Data with random noise

c. Data with long runs of repeated characters

d. Data with a lot of unique characters

What is the time complexity of building a max heap from an unsorted array?

a. O(n)

b. O(n^2)

c. O(logn)

d. O(nlogn)

In Radix Sort, if we have a maximum of 3 digits in the numbers, how many passes will the algorithm make?

a. 2

b. 3

c. 1

d. 4

If a character has the highest frequency in a data set, how would its Huffman code compare to other characters?

a. Its code length will be average

b. It will not have a code

c. It will have the longest code

d. It will have the shortest code

What is a disadvantage of linear probing in hash tables?

a. Requires additional memory for linked lists

b. Can lead to primary clustering

c. Inefficient for small hash tables

d. Complex to implement

What is the key idea behind Radix Sort?

a. Dividing the array into smaller sub-arrays and sorting them separately

b. Sorting based on individual digits or characters

c. Comparing each element with every other element

d. Sorting elements by swapping adjacent elements

What is the main purpose of Huffman encoding?

a. Data sorting

b. Data encryption

c. Data transmission

d. Data compression