

1. Which algorithm efficiently computes the Discrete Fourier Transform (DFT) for a sequence of length (  $N$  )?

- a) FFT algorithm
- b) DWT algorithm
- c) IDFT algorithm
- d) DCT algorithm

Answer: a) FFT algorithm

Explanation: The Fast Fourier Transform (FFT) algorithm is specifically designed to efficiently compute the DFT for a sequence of length (  $N$  ) by reducing the computational complexity from (  $O(N^2)$  ) to (  $O(N \log N)$  ).

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2. What is the primary technique used in the FFT algorithm to reduce computational complexity?

- a) Decimation in Time
- b) Decimation in Frequency
- c) Convolution
- d) Interpolation

Answer: a) Decimation in Time

Explanation: The FFT algorithm primarily utilizes the technique of decimation in time to divide

the computation into smaller DFTs, reducing the overall computational complexity.

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3. In the context of the FFT algorithm, what does 'decimation' refer to?

- a) Sampling
- b) Downsizing
- c) Filtering
- d) Quantization

Answer: b) Downsizing

Explanation: Decimation in the FFT algorithm involves downsizing the computation by dividing the input sequence into smaller subsequences, reducing the computational complexity.

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4. Which FFT algorithm variant is most suitable for sequences whose length is a power of 2?

- a) Radix-2 FFT
- b) Radix-4 FFT
- c) Cooley-Tukey FFT
- d) Bluestein FFT

Answer: a) Radix-2 FFT

Explanation: Radix-2 FFT is specifically optimized for sequences whose length is a power of 2, providing efficient computation in (  $O(N \log N)$  ) time complexity.

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5. Which of the following is NOT a step in the decimation in time FFT algorithm?

- a) Divide
- b) Conquer
- c) Combine
- d) Multiply

Answer: b) Conquer

Explanation: The decimation in time FFT algorithm involves the steps of dividing, multiplying, and combining smaller DFTs to compute the overall DFT efficiently.

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6. Which FFT algorithm variant is particularly advantageous for sequences with prime factors other than 2?

- a) Bluestein FFT
- b) Radix-2 FFT

- c) Cooley-Tukey FFT
- d) Radix-4 FFT

Answer: a) Bluestein FFT

Explanation: Bluestein FFT is beneficial for sequences with prime factors other than 2, as it handles composite lengths efficiently by transforming them into lengths that are powers of 2.

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7. What is the primary technique used in the decimation in frequency FFT algorithm?

- a) Time-reversal
- b) Frequency-domain filtering
- c) Convolution
- d) Amplitude modulation

Answer: b) Frequency-domain filtering

Explanation: Decimation in frequency FFT algorithm primarily involves filtering the frequency domain representation of the input sequence to reduce computational complexity.

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8. Which FFT algorithm variant is based on the divide-and-conquer strategy?

- a) Cooley-Tukey FFT
- b) Radix-2 FFT
- c) Bluestein FFT
- d) Mixed-radix FFT

Answer: a) Cooley-Tukey FFT

Explanation: Cooley-Tukey FFT algorithm employs the divide-and-conquer strategy to break down the DFT computation into smaller DFTs, which are then combined to obtain the final result efficiently.

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9. What is the primary advantage of the decimation in frequency FFT algorithm over decimation in time FFT algorithm?

- a) Better numerical stability
- b) Lower memory requirement
- c) Reduced arithmetic complexity
- d) Higher precision

Answer: b) Lower memory requirement

Explanation: Decimation in frequency FFT algorithm typically requires lower memory usage compared to decimation in time FFT algorithm, making it advantageous in memory-constrained environments.

10. Which FFT algorithm variant is particularly useful for sequences with mixed prime factors?

- a) Mixed-radix FFT
- b) Radix-2 FFT
- c) Cooley-Tukey FFT
- d) Bluestein FFT

Answer: a) Mixed-radix FFT

Explanation: Mixed-radix FFT algorithm is beneficial for sequences with mixed prime factors, as it can efficiently handle composite lengths by employing different radix sizes for factorization.

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