1. Which theorem forms the foundation of data compression algorithms by defining the limits of lossless compression?
a) Shannon’s Source Coding Theorem
b) Huffman’s Coding Theorem
c) Run Length Encoding Theorem
d) Arithmetic Coding Theorem

Answer: a) Shannon’s Source Coding Theorem
Explanation: Shannon’s Source Coding Theorem establishes the fundamental limit of lossless data compression. It states that the average code length produced by any uniquely decodable compression algorithm cannot be less than the entropy of the source.

2. Which coding technique guarantees the absence of any codeword being a prefix of another codeword?
a) Huffman coding
b) Shannon Fano Encoding
c) Arithmetic Coding
d) Lempel-Ziv Coding

Answer: b) Shannon Fano Encoding
Explanation: Shannon Fano Encoding is a prefix coding technique that ensures no codeword is a prefix of another. It divides the symbols into sets based on their probabilities and then assigns binary codewords to each set.

3. What is the primary advantage of Huffman coding over Shannon Fano Encoding?
a) Faster encoding process
b) Smaller average code length

c) Simpler implementation
d) Higher compression ratio

Answer: b) Smaller average code length
Explanation: Huffman coding produces optimal prefix codes that result in smaller average code lengths compared to Shannon Fano Encoding, leading to better compression efficiency.

4. Which coding technique is based on dividing the symbol set into intervals and encoding each symbol with a binary fraction within its corresponding interval?
a) Huffman coding
b) Arithmetic Coding
c) Run Length Encoding
d) Lempel-Ziv Coding

Answer: b) Arithmetic Coding
Explanation: Arithmetic Coding is a coding technique that assigns a unique interval to each symbol and encodes the entire message as a single fractional number between 0 and 1, providing high compression efficiency.

5. Which coding algorithm is particularly effective for compressing repetitive sequences in data?
a) Run Length Encoding
b) Lempel-Ziv Coding
c) Extended Huffman coding
d) Shannon’s Encoding Algorithm

Answer: b) Lempel-Ziv Coding

Explanation: Lempel-Ziv Coding is renowned for its effectiveness in compressing repetitive sequences by replacing them with references to previously encountered patterns.

6. In Extended Huffman coding, what additional feature is introduced compared to traditional Huffman coding?
a) Variable-length codes
b) Fixed-length codes
c) Adaptive coding
d) Context-based encoding

Answer: c) Adaptive coding
Explanation: Extended Huffman coding incorporates adaptive coding, where the codebook is updated dynamically based on the frequency of symbols encountered during encoding.

7. Which coding technique is primarily used for lossless data compression in image and video compression standards like PNG and MPEG?
a) Arithmetic Coding
b) Run Length Encoding
c) Huffman coding
d) Lempel-Ziv Coding

Answer: a) Arithmetic Coding
Explanation: Arithmetic Coding is widely used in image and video compression standards like PNG and MPEG for its ability to achieve high compression ratios while maintaining lossless data compression.

8. Which coding technique is most suitable for compressing data with long sequences of the

same symbol?
a) Huffman coding
b) Run Length Encoding
c) Lempel-Ziv Coding
d) Shannon Fano Encoding

Answer: b) Run Length Encoding
Explanation: Run Length Encoding efficiently compresses data with long sequences of the same symbol by representing them as a count-value pair, reducing redundancy in the data.

9. Which coding technique forms the basis for the LZ77 and LZ78 algorithms, widely used in file compression utilities like ZIP?
a) Run Length Encoding
b) Lempel-Ziv Coding
c) Huffman coding
d) Shannon Fano Encoding

Answer: b) Lempel-Ziv Coding
Explanation: Lempel-Ziv Coding serves as the foundation for LZ77 and LZ78 algorithms, essential components of many file compression utilities like ZIP, by identifying and replacing repetitive patterns in data.

10. Which coding technique focuses on encoding sequences of consecutive data elements as a single value and its count?
a) Huffman coding
b) Run Length Encoding
c) Arithmetic Coding

d) Shannon Fano Encoding

Answer: b) Run Length Encoding
Explanation: Run Length Encoding represents sequences of consecutive data elements as a count-value pair, efficiently reducing redundancy in the data and achieving compression.