

1. Explain runlength encoding?

The runlength encoding is simplest lossless encoding techniques. It is mainly used to compress text or digitized documents. Binary data strings are better compressed by runlength encoding. Consider the binary data string.

1 1 1 1 1 1 1 0 0 0 0 0 0 1 1 1 0 0 0 0

If we apply runlength coding to above data string. We get,

7, 1; 6, 0; 3, 1; 4, 0

Thus there are seven binary 1's followed by six binary 0's followed by three binary 1's and so on.

2. ***What are the types of compression?***

There are two types of compression

(i) **Lossless data compression**

Store or transport big files using few bytes so that the original files can be perfectly retrieved.

(ii) **Lossy data compression**

Store or transmit big files using few bytes so that the original files can be approximately retrieved.

3. ***What are the advantage of data compression?***

(i) Transmission data rate is reduced

(ii) Huge amount data is generated with a small amount of size.

(iii) Storage becomes less due to compression

(iv) Required less memory and store a large size of data.

4. ***Write the drawbacks of data compression.***

(i) Due to compression, some of the data is lost

(ii) Compression and decompression increases complexity of the transmitter and receiver.

(iii) Coding time is increased due to compression and decompression.

5. ***State the principle of static Huffman coding.***

In static Huffman coding, the character string to be transmitted is analyzed. The frequency of occurrence of each character is determined. The variable length codewords are then assigned to each character. The coding operation creates an unbalanced tree. It is also called Huffman coding tree.

6. ***State adaptive Huffman coding?***

In this method, the transmitter and receiver develop the Huffman coding tree dynamically depending upon the characters in the data stream. If the character is

not present in the (i.e. occurring first time) data stream, then it is transmitted in its uncompressed form. The receiver identifies this character and add to the coding tree. If the character is present in the coding tree, then its codeword is transmitted. Depending upon this codewords, the receiver identifies the character. The transmitter and receiver then both increment the frequency of occurrence of such character. The position of the character in Huffman tree is adjusted depending upon its frequency of occurrence. This is also called Adaptive (or) Dynamic Huffman Coding.

7. *Compare static coding and dynamic coding.*

S.No	Static Coding	Dynamic coding
1	Code words are fixed throughout compression	Codewords change dynamically during compression
2	Statical characteristics of the data are known	Statical characteristics of the data are not known
3	Receiver knows the set of codewords	Receiver dynamically calculates the codewords
4	Example: Static Huffman Coding	Example: Dynamic Huffman Coding

8. *State various text compression methods.*

1. Static Huffman Coding
2. Arithmetic Coding
3. Dynamic Huffman Coding
4. Lempel-ziv algorithms

9. *Why adaptive Huffman Coding? Drawbacks of static Huffman Coding.*

- (i) The algorithms require the statical knowledge which is often not available (e.g. live audio, video), this can need more bit to encode the file.
- (ii) Even when it is available, it could be a heavy overhead.
- (iii) Static coding requires two passes: One pass to compute probabilities (or frequencies) and determine the mapping, and a second pass to encode. So we go for adaptive algorithms.

10. **What is Adaptive Huffman Coding (also called Dynamic Huffman Coding)?**
- ✓ It is an adaptive coding technique based on Huffman Coding.
 - ✓ It is more flexible and has a better compression.
 - ✓ Straight compression algorithm
 - ✓ Prefix code
 - ✓ Fixed-to-variable length code
 - ✓ Optimization to create a best code.

11. **How arithmetic coding is advantages over Huffman coding for text compression?**

S.No.	Huffman Coding	Arithmetic Coding
1	Codes for the characters are derived.	Coding is done for messages of short lengths.
2	Shannon's rate is achieved only if character probabilities are all integer powers of $\frac{1}{2}$.	Shannon's rate is always achieved irrespective of probabilities of characters.
3	Precision of the computer does not affect coding.	Precision of the computer determine length of the character string that can be encoded.
4	Huffman coding is the simple technique.	Arithmetic coding is complicated.

12. **Compare Huffman and Lempel Ziv coding.**

S.No.	Huffman	Lempel-Ziv
1	A Huffman encoder takes a block of input characters with fixed length and produces a block of output bits of variable length.	Lempel-Ziv is a variable to fixed length code.
2	Huffman coding is an entropy encoding algorithm used for lossless data compression.	It is the most widely used technique for lossless file compression.

13. What is arithmetic Coding?

Arithmetic Coding is a form of entropy encoding used in lossless compression. It has good compression ratio and high efficiency.

14. What is Lempel-ziv Welch Code (LZW)?

Lempel-ziv Welch is a dictionary-based compression method. It maps a variable number of symbols to a fixed length code.

LZW is a good example of compression or communication schemes that 'transmit the model', rather than 'transmit the data'.

15. Write the drawbacks of LZW.

- ✓ Too many bits per word
- ✓ Everyone needs a dictionary
- ✓ Only works for English text.

16. State the main application of graphics Interchange format (GIF).

The GIF format is used mainly with internet to represent and compress graphical images.

GIF images can be transmitted and stored over the network in interlaced mode, this is very useful when images are transmitted over low bit rate channels.

17. What is JPEG standard?

JPEG stands for joint photographic experts group. This has developed a standard for compression of monochrome/ color still photographs and images. This compression standard is known as JPEG standard. It is also known as ISO standard 10918.