

| Source symbols | Code C | Code D | Code E |
|----------------|--------|--------|--------|
| s_1 | 00 | 0 | 0 |
| s_2 | 01 | 10 | 01 |
| s_3 | 10 | 110 | 011 |
| s_4 | 11 | 1110 | 0111 |

Received sequence ; $R = 001100$

using different coding schemes:

Code C : $s_1 s_4 s_1$

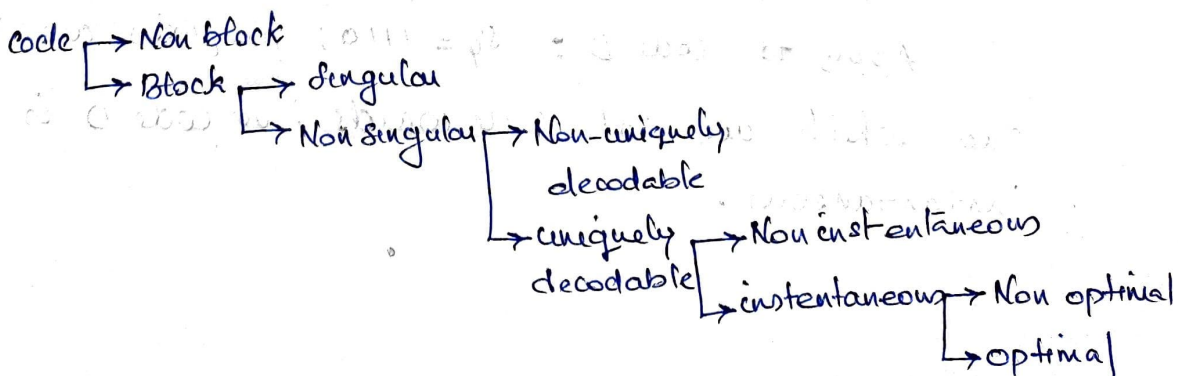
Code D : $s_1 s_1 s_3 s_1$

Code E : $s_1 s_3 s_1 s_1$

When code D is used for decoding, '0' arrives at receiver, it can immediately be decoded as ' s_1 ', because no other codewords are started with a '0'. A second zero is decoded as s_1 again. Here when a '0' arrives, it ends each code word, i.e. an imaginary "comma" may be inserted at the receiver after the reception of every zero. Then it is decoded. So it is called a "COMMA CODE".

5. Optimal Codes:

An instantaneous code is said to be "optimal code" if it has "minimum average length L " for a source with a given probability assignment for the source symbol.



Code property as tree diagram :

Prefix of a code :

Let $x = x_1 x_2 \dots x_m$ be a code word of some code, then the sequence $x_1 x_2 \dots x_j$ for all $j < m$ are called 'prefixes' of code x .

eg: Let $x = 0111$ $m=4$

when $j=1$; 0
 $j=2$; 01
 $j=3$; 011 } prefixes of code x .

Test for instantaneous Property (prefix property) :

A necessary and sufficient condition for a uniquely decodable code to be instantaneous is that

"No complete word of a code word be a prefix of any other code word"

→ If prefixes are present : code is not instantaneous.

→ If prefixes are not present : code is instantaneous.

Even if one prefix is present, the code will not be instantaneous.

Applying test to code E , for $s_4 = 0111$, prefixes are $0, 01, 011$, which are the code words of s_1, s_2, s_3 . So code E is not instantaneous.

Apply to code D : $s_4 = 1110$; prefixes are $1, 11, 111$, and which are not code words; so code D is instantaneous.