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Section-9

Q.3 3-bit Tunstall code -

For 3-bit Tunstall code, the maximum number of codewords in the codebook is $2^3 = 8$.

given that -

Symbol	Initial probability
a_1	0.7
a_2	0.2
a_3	0.1

Taking the symbol with highest probability i.e a_1 & concatenate it with every other symbol and remove a_1 from the list. So the entries in the codebook will be :

Sequence	Probability
a_2	0.2
a_3	0.1
$a_1 a_1$	0.49
$a_1 a_2$	0.14
$a_1 a_3$	0.07

As number of codewords is less than max. value, again apply the same procedure with $a_1 a_1$ (max. probability).

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Sequence	Probability
a_2	0.2
a_3	0.1
$a_1 a_2$	0.14
$a_1 a_3$	0.07
$a_1 a_1 a_2$	0.098
$a_1 a_1 a_3$	0.049
$a_1 a_1 a_1$	0.343

We have to stop here as if we apply one more step iteration, the no. of codeword increases the maximum limit. Thus the sequence will become:

Sequence	Codeword
a_2	000
a_3	001
$a_1 a_2$	010
$a_1 a_3$	011
$a_1 a_1 a_2$	100
$a_1 a_1 a_3$	101
$a_1 a_1 a_1$	110