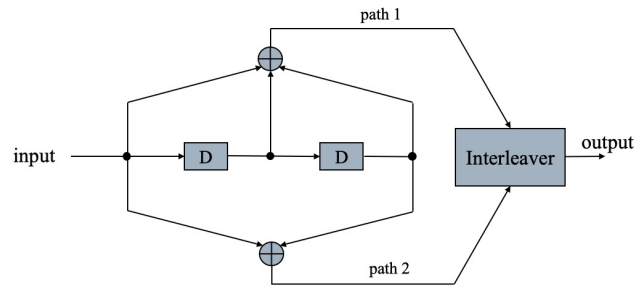
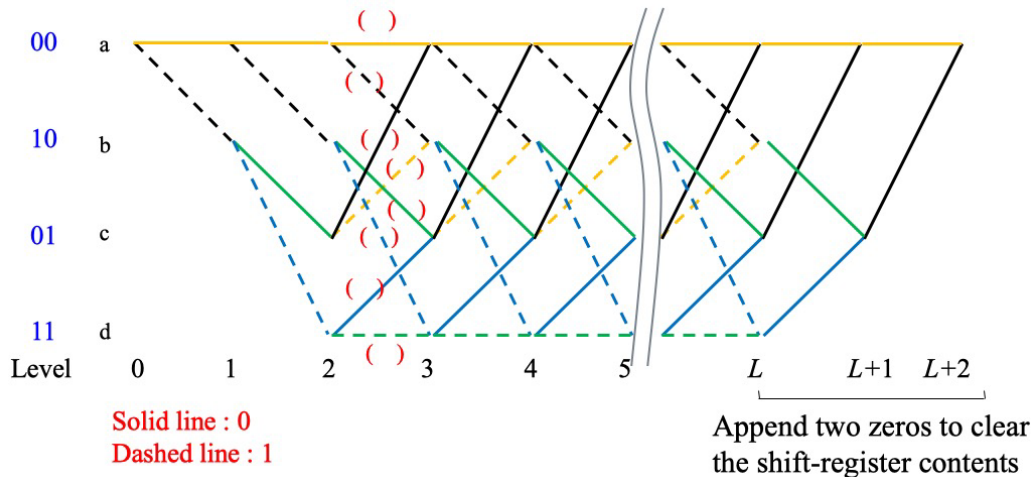


1. (a) (64%) For the convolutional code given below,



fill in the *code bits* inside the red-color parentheses on the code trellis.



- (b) (36%) What is the effective code rate of this convolutional code if $L = 2$?

Solution.

- (a) Let me give you an example of how these parentheses can be filled. At state *c*, where the two shift registers contain 01, when input is 0, then path 1 gives $0 \oplus 0 \oplus 1 = 1$ and path 2 gives $0 \oplus 1 = 1$; thus, the output code bits are 11 (the next state is 00). When input is 1, then path 1 gives $1 \oplus 0 \oplus 1 = 0$ and path 2 gives $1 \oplus 1 = 0$; thus, the output code bits are 00 (and the next state is 10).

For the solution, see Slide IDC 7-69.

- (b) This is an $(n, k, m) = (2, 1, 2)$ convolutional code. Hence, the effective code rate is equal to $\frac{kL}{n(L+m)} = 2/8 = 1/4$.