

# S-72.3320 Advanced Digital Communication

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Naser Tarhuni <ntarhuni@cc.hut.fi>

## Convolutional Codes

1. Diagram the encoders for

- A *systematic*<sup>1</sup> (3,2,3) convolutional code
- A *systematic* (4,3,1) convolutional code

Label the input and output rates and the current input state and state at arbitrary time.

2. A (3,1,2) encoder achieves maximum free distance when

$$x'_j = m_{j-2} \oplus m_j \quad x''_j = x'''_j = m_{j-1} \oplus x'_j$$

- Construct the code trellis and state diagram
- Find the state and output sequence produced by the input sequence 1011001111.
- Construct the modified state diagram (Splitting and labeling the state diagram), identify the minimum-weight path or paths and determine the values of the free distance  $d_f$ .

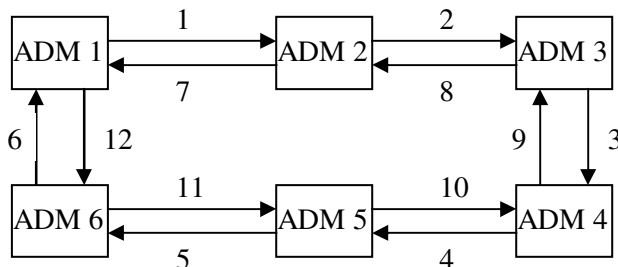
## Fiber Optics and Optical Networks

3. A silica fibre which has a core refractive index of 1.50 and a cladding refractive index of 1.47. Determine:

- The critical angle at the core-cladding interface the
- Numerical aperture (NA) for the fiber
- The acceptance angle in air for the fiber.

4. Consider the two-fiber bidirectional line switched ring (2F-BLSR) shown below. Assume that the total capacity of each fiber link is STM-4 traffic. What is the total available capacity of the ring for the transmission of the working traffic from ADM 1 to ADM 2:

- When all fibers are working?
- When fibers 2 and 8 fail?
- When fiber 12 fails after fibers 2 and 8 have failed?



<sup>1</sup> A. B. Carlson: Communication Systems.