

# Exercises on

## - Physical Layer

### Exercise 3

- Three packet switching networks each contain  $n$  nodes. The first network has a star topology with a central switch, the second is a bi-directional ring, and the third is fully interconnected, with a wire from every node to every other node. What are the best, average, and worst case transmission paths in hops?

### Exercise 1

- A noiseless 4 kHz channel is sampled every 1 msec. What is the maximum data rate?

### Exercise 4

- What signal-to-noise ratio is needed to put a T1 carrier on a 50-kHz line?

### Exercise 2

- If a binary signal is sent over a 3 kHz channel whose signal-to-noise ratio is 20dB, what is the maximum achievable data rate?
- What is the maximum achievable data rate if we used 3 signal levels instead of 2 signal levels?