ELEX 3525 Quiz 3 **Paper, 1** A00123456 0

Show your work and underline your final answer. Numeric answers must include units. Books, notes and calculators allowed. No other electronic devices allowed.

1. A system uses differential signalling over a wire pair. You connect two channels of an oscilloscope to measure the voltages on the two conductors. These are labelled `D+` and `D-` (the differential voltage is positive when `D+` is greater than `D-`). At one point in time `D+` has a voltage of 3V and `D-` has a voltage of 2V. What are the common-mode and differential voltages at this time?

2. A communication system transmits data using four voltages: −3V, −1V, +1V, and +3V. The receiver uses three decision thresholds half-way between the voltages. The channel adds zero-mean Gaussian noise with a voltage of $0.43\mathrm{V_{rms}}$.

   (a) What is the average signal power, assuming a 1Ω resistance, if each of the four levels is equally probable? What is the noise power? What is the SNR in dB?

   (b) What is the probability of (symbol) error if a level of +3 V is transmitted?

ELEX 3525 Quiz 3 **Paper, 2** A00123456 255

Show your work and underline your final answer. Numeric answers must include units. Books, notes and calculators allowed. No other electronic devices allowed.

1. A system uses differential signalling over a wire pair. You connect two channels of an oscilloscope to measure the voltages on the two conductors. These are labelled `D+` and `D-` (the differential voltage is positive when `D+` is greater than `D-`). At one point in time `D+` has a voltage of 2V and `D-` has a voltage of 1V. What are the common-mode and differential voltages at this time?

2. A communication system transmits data using four voltages: −3V, −1V, +1V, and +3V. The receiver uses three decision thresholds half-way between the voltages. The channel adds zero-mean Gaussian noise with a voltage of $0.43\mathrm{V_{rms}}$.

   (a) What is the average signal power, assuming a 1Ω resistance, if each of the four levels is equally probable? What is the noise power? What is the SNR in dB?

   (b) What is the probability of (symbol) error if a level of −3 V is transmitted?