Stefanus ARinno Wirdatmadja
stefanus.wirdatmadja @ tut.fi

TLT-5206 COMMUNICATION THEORY Midterm Exam 04.12.2012

Prepared by M.Valkama, no materials, no calculators

(*Suomenkieliset kysymykset paperin toisella puolella*)

1. **Sampling of signals.** Present the time domain mathematical model for ideal sampling process. Given the spectrum of a continuous-time signal, sketch (i.e., draw) also the corresponding spectrum after ideal sampling. Based on that, formulate the basic requirement in order to avoid aliasing. Explain also the basic idea of reconstruction in both time and frequency domains. Finally, tell the basic idea of sub-sampling principle in bandpass signal context.

2. **Information theoretic basis of communications.** Explain the concepts of information and entropy. Give some examples. Explain also what mutual information means. Explain further the concept of channel capacity and how is it related to mutual information concept. How physical quantities like bandwidth, signal power and noise power affect the capacity typically?

3. **Digital transmission.** Explain the concept digital transmission at conceptual level. Explain how digital pulse amplitude modulation principle works. What are the key functionalities of transmitter and receiver in a digital baseband PAM transmission system? What does Nyquist pulse-shaping mean? How does the bit rate depend on the available bandwidth and other possible parameters? Explain also how I/Q modulation is combined to baseband PAM principle for radio communications purposes.

Maximum points: 3x 5 = 15p.