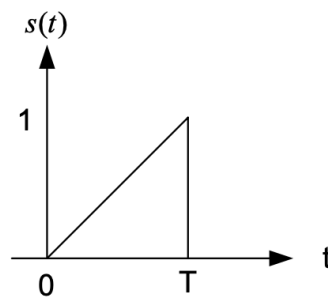


## EHB308E – COMMUNICATIONS II

### Basic Questions - 1

1. What is line coding in baseband transmission? Why is it used?
2. Give examples of line coding techniques. Which ones has average DC component?
3. What is the difference between “line coding” and “channel coding”?
4. In a PCM system, how does the SNR at demodulator changes with number of quantization levels and the bit error rate in the channel? Explain briefly.
5. Describe the inter-symbol interference (ISI) problem in baseband transmission.
6. Which criterion has to be met to eliminate ISI? Give 2 examples of functions that can be designed to have no ISI.
7. The sampled signal before the slicer (decision circuit) can be written as  $r_k = a_k + ca_{k-1} + n_k$ . If signal-to-interference power ratio is known to be 10 dB, find  $c$ .
8. Express the bandwidth efficiency including its unit.
9. Draw the block diagram of a receiver using matched filter (MF). Explain why do we use MF at receiver. If the noise before the MF is AWGN, would the noise at the output be white? Would it be Gaussian?
10. Write the expression for the impulse response of the MF as a function of the transmitted signal  $s(t)$ . Draw the impulse response of the filter matched to function below.



11. Consider arbitrary functions  $k(t)$  and  $l(t)$  which are chosen for sending bit “0” and bit “1”, respectively. That is,  $s(t) \in \{s_0(t) = k(t), s_1(t) = l(t)\}$ . Both functions have the same energy  $E$ . Design a receiver to receive and decide on the transmitted bit (draw receiver block diagram, describe operations on each block, and explain the decision rule).
12. Show that a single MF and sampler is enough for a modulation where we can write all possible transmitted signals as multiple of a single function:  $s_i(t) = a_i g_T(t)$ .
13. Is there a difference between matched filter and correlator-type receiver in terms of error performance? Explain.
14. If the random variable  $n$  is zero mean Gaussian with variance  $N$ , write the PDF of  $r = V_i + n$ ,  $f_{r|V_i}(r|V_i)$ .
15. If the probability of bit 0 being sent (with level  $V_0 = -A$  at slicer input) is twice of the probability of bit 1 being (with level  $V_1 = +A$  at slicer input), and Gaussian noise power is  $N$ , express the minimum average error probability in terms of  $A$  and  $N$ .