582487 Data Compression Techniques (Spring 2012)
Additional Exercises

Solve the exercises on your own. Do not return. Model solutions will be posted on the course home page before the exam.

1. Let $T = \texttt{abracadabra\$}$.
   (a) Give the FM-index for T, i.e., the wavelet tree of the Burrows-Wheeler transform.
   (b) Simulate backward search with pattern $P = \texttt{bra}$.

2. Design a succinct graph data structure based on the adjacency matrix representation of graphs.

   Hint: Concatenate the rows of the matrix and compress.

3. The balanced parentheses representation of trees supports several operations in addition to those given on the lectures. Describe how the following operations can be implemented:
   (a) is-ancestor
   (b) postorder-rank
   (c) last-child
   (d) previous-sibling

4. Gap encoding represents a bit vector as the sequence of the gap lengths between the 1-bits. The lengths are encoded using γ or δ code.

   Compute the following quantities for the bit vector $B = 0^k 1^k$.
   (a) $2kH_0(B)$
   (b) $2kH_1(B)$
   (c) The length of gap encoding using γ code.
   (d) The length of gap encoding using δ code.

   The lower order terms can be asymptotic.

5. Please fill the anonymous course feedback form at `https://ilmo.cs.helsinki.fi/kurssit/servlet/Valinta?kieli=en`.