2008 Advanced Coding Theorem HW#2   Due date :2008.04.11

1. Let C be the LDPC code given by the null space of H, which is

$$\mathbf{H} = \begin{bmatrix} 1 & 1 & 0 & 1 & 0 & 0 & 0 \\ 0 & 1 & 1 & 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 1 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 & 1 & 0 & 1 \\ 1 & 0 & 0 & 0 & 1 & 1 & 0 \\ 0 & 1 & 0 & 0 & 0 & 1 & 1 \\ 1 & 0 & 1 & 0 & 0 & 0 & 1 \end{bmatrix}$$

   (a) Please find out the minimum distance of C.

   (b) Please construct the bipartite graph of C.

   (c) Does the bipartite graph of this code contain cycles of 4?

   (d) Determine the number of cycles of length 6 in the graph.

2. Consider LDPC code with

$$\mathbf{H} = \begin{bmatrix} 1 & 1 & 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 & 1 & 1 \\ 1 & 0 & 1 & 0 & 1 & 0 \\ 0 & 1 & 0 & 1 & 0 & 1 \end{bmatrix}$$

   The initial message is $\{u_v^{(0)}\} = \{1.3, -0.9, 0.2, -0.2, -1.1, -0.4\}$

   Do SPA (Sum-Product Algorithm) with the maximum number of iterations $I_{max}=3$.

Rev. 1.1