

EE2302 Foundations of Information and Data Engineering

Assignment 9

Due: 11 pm, Nov 25

Full Mark: 16 points

1. Consider the binary linear code which adds three parity bits c_3, c_4, c_5 to two information bits u_1, u_2 as follows: $c_3 = u_1, c_4 = u_1 + u_2, c_5 = u_2$.
 - a) (1 marks) List all its codewords.
 - b) (2 marks) Does the code (i.e., the set of all codewords) form a subspace of \mathbb{B}^5 ? Briefly explain your answer. (Note that binary addition is the same as logical XOR while binary multiplication is the same as logical AND.)
 - c) (1 mark) Determine its minimum distance, and state its error correction capability.
 - d) (2 marks) Determine its generator matrix and parity check matrix.
 - e) (1 mark) Suppose the vector $(1, 0, 0, 1, 0)$ is received. Compute the syndrome.
 - f) (2 marks) Use the syndrome to identify the error bit, if any. Explain your reasoning.
2. Consider the $(5, 1)$ repetition code.
 - a) (1 mark) Is it a systematic code? Why?
 - b) (2 mark) Determine its generator matrix and parity check matrix.
 - c) (4 marks) Compare it with the code in Question 1.