1. Smart Codes

Problem 1. (5 points + 1 bonus point) The instructor will give you a sequence of 10 digits. Check if it is a valid ISBN number. If not, change the check bit so that it is valid. Figure out to which book this ISBN refers. If you can help the instructor decide whether it is worth reading, you will receive one bonus point.

Problem 2. (5 points) What is the information rate of repeating $[n, k]$-code in terms of k and n?

Problem 3. (5 points) Can repeating $[4, 2]$-code detect single digit error? You will receive points only with a good explanation.

Problem 4. (1 point) What's your favorite book?

Problem 5. (5 points each) Determine which of the following are valid Hamming's square codewords. If not valid, figure out whether there is transposition or single bit error. Fix the error.

(a) 110000101
(b) 110010110
(c) 110011101

Problem 6. (10 points or -5 points based on the result of a post problem coin flip) The instructor will give you a decimal integer that has a four bit binary expansion. You have 2 minutes to convert the number to binary and encode the four bits using Hamming's square code.

Problem 7. (The point value is the random number generated by Orbo) Ditto Problem 6 but Orbo, a random number generator, produces the integer. Race the instructor. If you win, your team gets the points. If the instructor wins, they kick you out of the meeting.

Problem 8. (5 points) What is the information rate of Hamming's 6×4 rectangular code?