MATHS 415 **Project #2** **Dr. Jones**

Your task in this project is to design an error-correcting code (from the class of Generalized BCH codes) for each of the following scenarios. Your code should be "best possible" in the following sense:

1. the code meets the specifications of the scenario
2. among codes satisfying 1. it has the lowest percentage of 'overhead' (extra bits)
3. among codes having negligibly different overhead percentage, it has the shortest symbol length

You need to design each code **and** justify why you believe it is the best possible code.

Scenarios:

A: a channel which has a bit error rate of 1 in 10^4, with uncorrelated errors – correct to at most 1 error in 10^{12} data bits.

B: a channel which has an average bit error rate of 1 in 10^4, but errors occur in bursts of 10 to 30 bits in length; after an error burst, the next 900 bits are guaranteed error-free – correct this channel completely.

C: same channel and error target as **B**, but, for cost reasons, the symbol size is limited to at most 4 bits.

D: same as **C**, but even cheaper: only binary (1-bit symbol) codes may be used.

Extra Credit: On a few occasions, we have mentioned the possibility of the existence of a 2-bit-correcting (15,8) code. Either demonstrate a cyclic code (that is, a linear block code generated by a polynomial) like this *or* show that no such cyclic code exists (it doesn't have to be a Generalized BCH code, but it does have to be cyclic).