Deadline 15 May

1. Find out the G1 matrix for Hamming Codes discussed in class. Find out G2 for Hamming Code given in the file named "Hamming code".

2. As has already been mentioned in file named "Hamming Code", Hamming code only when arranged in a different fashion is a cyclic code. Enumerate all possible codewords of a 4/7 Hamming Code generated by G2 matrix above. Show that it is cyclic.

3. Minimum Distance
Distance between two codewords c1 and c2 is defined as the number of ones in c1+c2. For example, codes 1111001 and 1001011 have a distance of 3, codewords 1000111 and 1000110 have a distance of 1. Whenever a coding scheme is designed, it is desirable that the minimum distance between any two codewords be maximum possible. If $d_{min}$ denotes the minimum distance of a coding scheme (that is, if we enumerate all possible 2^k codewords, the minimum distance between any two of them is $d_{min}$ ), then the error correcting capability of that coding scheme is given by $t = \left\lfloor \frac{d_{\min} - 1}{2} \right\rfloor$.
Example : A 1/3 repetition coding scheme has two possible codewords 000 and 111. The minimum distance is 3. Hence the error correcting capability is 1.

Exercise : Find out the minimum distance of 4/7 Hamming code. Note that minimum distance of Hamming code remains same whether it is generated using G1 or G2.

4. Prove that for Linear Block Codes, minimum distance is same as the weight of least weight non zero codeword. Weight is same as number of ones in a vector.