

You need to be alert to (usually minor) changes that may be made to the assignment statement or to the guidelines after the assignment is first put up. Refresh this frame and re-read the assignment carefully before you make your final submission.

Q1

Illustrate the working of the double-dabble algorithm to convert a given integer to BCD. The input is to be derived by mapping your roll number $yyDDx.z.zz$ to $ddxsss$ (6-digit BCD: $B_6B_5B_4B_3B_2B_1$),

- mapping the department character code DD to a numerical code dd as follows: $AE \rightarrow 11$, $CE \rightarrow 12$, $EX \rightarrow 13$, $GG \rightarrow 14$, $ME \rightarrow 15$, $CH \rightarrow 16$, $CS \rightarrow 17$, $CY \rightarrow 18$, $IM \rightarrow 19$, $MA \rightarrow 20$, $ME \rightarrow 21$, $MF \rightarrow 22$

and determining sss as the last three digits of $zz \times zz$. Your answer should be a sequence of L (for left shift by 1-bit) and A_j (for add 3 to B_j of the current step)

Q2

The parity bits for a 7-bit Hamming code are defined as follows:

- $P_1 = D_1 \oplus D_2 \oplus D_4$
- $P_2 = D_1 \oplus D_3 \oplus D_4$
- $P_3 = D_2 \oplus D_3 \oplus D_4$

Let the bits be represented as the vector B^T :

D_4	D_3	D_2	P_3	D_1	P_2	P_1
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Let the inputs be given as the vector A^T :

D_4	D_3	D_2	D_1
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What will be matrix H so that $B = H \cdot A$ (with operations being AND and EXOR)?

Q3

What will be the matrix C so that $\langle E_3E_2E_1 \rangle = E = B^T \cdot C$ is the vector indicating errors in the three parity bits (with operations being AND and EXOR)?

Q4

- Let $f : \mathbb{B}^k \rightarrow \mathbb{B}^k$ be a function to map a k -bit binary number code to a k -bit Gray code
- Let $r : \mathbb{B}^k \rightarrow \mathbb{B}^k$ be a function to perform a fixed number (say m) of left rotations on a k -bit string over \mathbb{B}
- Note that Gray code is cyclic, so it remains cyclic after applying a fixed number (say m) of left rotations, let the new code be called the H -code
- Let X be H -code value (item), give an expression to determine the H -code successor of X utilising f , r and any other function that may be necessary

Marking guidelines

Assignment marking is to be done only **after** the deadline expires, as submissions gets blocked after the assignment is marked. Enter the breakup of marks while marking.

Q1	
No mistakes	10
Few mistakes but sensible steps	5
Otherwise	0
Q2	
No mistakes	10
Few mistakes but sensible entries	5
Otherwise	0
Q3	
No mistakes	5
Otherwise	0
Q4	
No mistakes	5
Otherwise	0
Total Marks	30

Submission

- Answers are to be entered in a text file and uploaded.
- Matrices should be entered one row per line with the entries separated by commas.

Use electronic submission via the [WBCM link](#)

You should keep submitting your incomplete assignment from time to time after making some progress, as you can submit any number of times before the deadline expires. **You should submit all your files together.**

Warning

Cases of copying will be dealt with seriously and severely, with recommendation to the Dean to de-register the student from the course.