An introduction to coding theory

Assignment-2
February 1, 2017

Q 1: A linear block code is specified by its generator matrix $G$ as given below (use the same matrix for question number 1 to 6)

\[
G = \begin{bmatrix}
1 & 1 & 0 & 1 & 0 & 0 \\
1 & 1 & 1 & 0 & 1 & 0 \\
0 & 1 & 1 & 0 & 0 & 1
\end{bmatrix}
\]

Then, minimum distance of the code is.

(a) 2
(b) 3
(c) 4
(d) 5

Q 2: How many errors can this code can detect?

(a) 1
(b) 2
(c) 3
(d) None of the above.

Q 3: Code can correct single error

(a) true
(b) false

Q 4: Code can simultaneously correct and detect single error

(a) true
(b) false

Q 5: Code can simultaneously correct 2 errors and 1 erasure

(a) true
(b) false

Q 6: The codewords are sent over a binary symmetric channel (BSC) with crossover probability $p = 0.2$. Undetected error probability is given by

(a) 0.28
(b) 0.38
(c) 0.2
(d) None of the above.

**Q 7:** A linear block code is specified by its parity check matrix $\mathbf{H}$ as given below (use the same matrix for question number 7 to 10)

$$
\mathbf{H} = \begin{bmatrix}
0 & 0 & 0 & 1 & 0 & 1 \\
1 & 0 & 1 & 0 & 0 & 1 \\
0 & 1 & 0 & 1 & 1 & 0
\end{bmatrix}
$$

Then, 010000 and 110000 can be coset leaders?

(a) **true**  
(b) **false**

**Q 8:** Syndrome corresponding to error pattern 100001 is

(a) **001**  
(b) 100  
(c) 110  
(d) 101

**Q 9:** Which of the following can be a possible generator matrix for this code?

(a) $\mathbf{G} = \begin{bmatrix}
1 & 1 & 1 & 0 & 0 & 0 \\
1 & 1 & 0 & 1 & 1 & 0 \\
1 & 0 & 0 & 1 & 0 & 1
\end{bmatrix}$

(b) $\mathbf{G} = \begin{bmatrix}
1 & 1 & 1 & 0 & 0 & 1 \\
1 & 1 & 0 & 1 & 1 & 0 \\
1 & 0 & 1 & 1 & 0 & 1
\end{bmatrix}$

(c) $\mathbf{G} = \begin{bmatrix}
1 & 1 & 1 & 0 & 0 & 0 \\
1 & 1 & 0 & 1 & 1 & 1 \\
1 & 1 & 0 & 1 & 0 & 1
\end{bmatrix}$

(d) None of the above

**Q 10:** Syndrome corresponding to error pattern 100000 is 011

(a) **true**  
(b) **false**

**Q 11:** If the generator matrix is what you get from Q-9, the codeword for “011” is

(a) 000011  
(b) 000010  
(c) 011011  
(d) **010001**