COMP4097 Mobile Computing
Assignment 2

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1. a) As the hamming code (7 4) requires a message length of 4, we split it into 2 parts: 1000 and 1010.

The first part (assuming the pattern M7 M6 M5 P4 M3 P2 P1) is:

$$
\left.
\begin{array}{l}
1\ 0\ 0\ \_\ 0\ \_\ \_ \\
1\ 0\ 0\ \_\ 0\ \_\ 1 \\
1\ 0\ 0\ \_\ 0\ 1\ 1 \\
1\ 0\ 0\ 0\ 0\ 1\ 1
\end{array}
\right\}
\begin{array}{l}
P1\!:\ \_001 \rightarrow 0+0+1 = 1\ (odd) \rightarrow 1001 \\
P2\!:\ \_001 \rightarrow 0+0+1 = 1\ (odd) \rightarrow 1001 \\
P4\!:\ \_101 \rightarrow 1+0+1 = 2\ (even) \rightarrow 0101
\end{array}
$$

The second part is:

$$
\left.
\begin{array}{l}
1\ 0\ 1\ \_\ 0\ \_\ \_ \\
1\ 0\ 1\ \_\ 0\ \_\ 0 \\
1\ 0\ 1\ \_\ 0\ 1\ 0 \\
1\ 0\ 1\ 0\ 0\ 1\ 0
\end{array}
\right\}
\begin{array}{l}
P1\!:\ \_001 \rightarrow 0+1+1 = 2\ (even) \rightarrow 0011 \\
P2\!:\ \_001 \rightarrow 0+0+1 = 1\ (odd) \rightarrow 1001 \\
P4\!:\ \_101 \rightarrow 1+0+1 = 2\ (even) \rightarrow 0101
\end{array}
$$

So the message transmitted to Station B will be 1001011 1010010

1. b) We receive 2 messages: 1011011 and 1011010. For the first message we check all parity bits:

P1: $1011 \rightarrow 1+0+1+1 = 3$ ✗
P2: $1001 \rightarrow 1+0+0+1 = 2$ ✓
P4: $1101 \rightarrow 1+1+0+1 = 3$ ✗

Correcting the message with $P1 + P4 = 5$ to 1001011.

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We check the parity bits in the second message:

P1: $0011 \rightarrow 0 + 0 + 1 + 1 = 2$ ✓
P2: $1001 \rightarrow 1 + 0 + 0 + 1 = 2$ ✓
P4: $1101 \rightarrow 1 + 1 + 0 + 1 = 3$ ✗

Correcting the message with P4 = 4 to 1010010.

1. c) We again receive 2 messages after the spike: 1100111 and 1011010. The first message check results in:

P1: $1101 \rightarrow 1 + 1 + 0 + 1 = 3$ ✗
P2: $1111 \rightarrow 1 + 1 + 1 + 1 = 4$ ✓
P4: $0011 \rightarrow 0 + 0 + 1 + 1 = 2$ ✓

Correcting the message with P1 = 1 to 1100110.

The second message check:

P1: $0011 \rightarrow 0 + 0 + 1 + 1 = 2$ ✓
P2: $1001 \rightarrow 1 + 0 + 0 + 1 = 2$ ✓
P4: $1101 \rightarrow 1 + 1 + 0 + 1 = 3$ ✗

Correcting the message with P4 = 4 to 1010010.

The channel seems to be quite unreliable but we manage to fix all errors thanks to the hamming code encoding.